

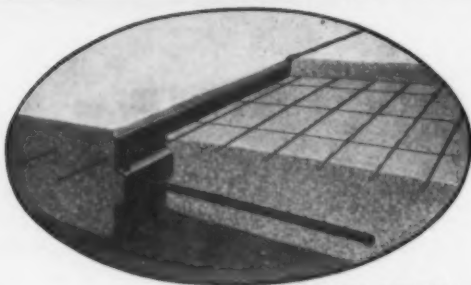
62
APRIL 1925

25 Cents \$1 a Year

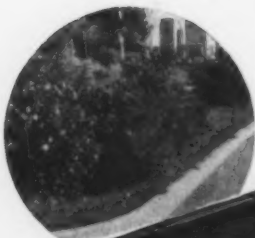
Contractors' *and* Engineers' Monthly



NEW---AND BUILT TO REMAIN NEW



Notice particularly the right-angle shoulder of the Truscon Contraction Joint. This prevents one slab rising above adjacent ones.



Truscon Curb Bar in the exposed edge of the curb saves curb appearance and eliminates the expense of breakage.



THE serviceable and pleasurable new road surface can be kept that way with Truscon Wire Mesh and Contraction Joints. Wire Mesh is a steel fabric, electrically cross-welded, which binds the concrete slabs against cracking. It comes in flat sheets easily and quickly applied.

Changes in temperature cause expansion and contraction in concrete. This is destructive to roads unless Truscon Contraction Joints are used. These joints provide a slab separation which allows contraction and expansion without affecting the solid texture of the concrete.

**Ask for "Modern Road Construction."
It is Free.**

TRUSCON STEEL COMPANY
Youngstown, Ohio

*Warehouses and Sales Offices in Principal Cities.
Canada: Walkerville, Ont. Foreign Div.: New York.*

TRUSCON
WIRE MESH AND
CONTRACTION JOINTS

Where to Purchase

A comprehensive classification of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers and public officials who may wish to secure information about construction equipment.



The Index to Advertisers faces the inside back cover. When writing to advertisers please mention the **CONTRACTORS' & ENGINEERS' MONTHLY**. A star (*) before the manufacturer's name indicates that his advertisement appears in this issue.

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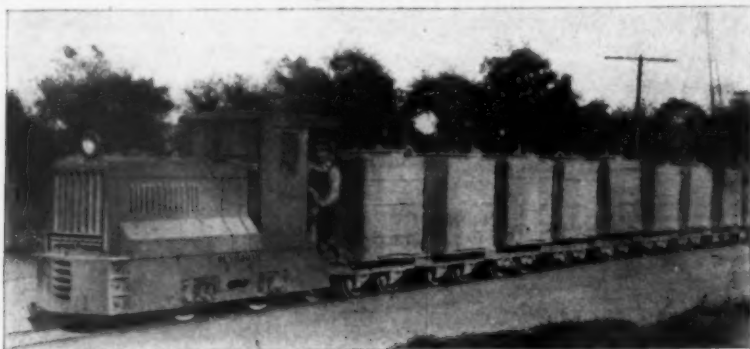
BAR CHAIRS, REINFORCING

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G. P. Scharl, prominent Contractor of Grand Rapids, has used various makes of gasoline locomotives for a number of years.

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HC251

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Plymouth Locomotive Works
PLYMOUTH, OHIO

G. P. SCHARL
General Contracting
Grand Rapids, Mich.

Nov. 17, 1924.

The Fate-Root-Heath Co.,
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On our Eagle job where conditions were more favorable, we hauled 30 cars, our maximum haul being three miles.

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Yours very truly,
G. P. Scharl.

(Signed)

PLYMOUTH

Gasoline Locomotives

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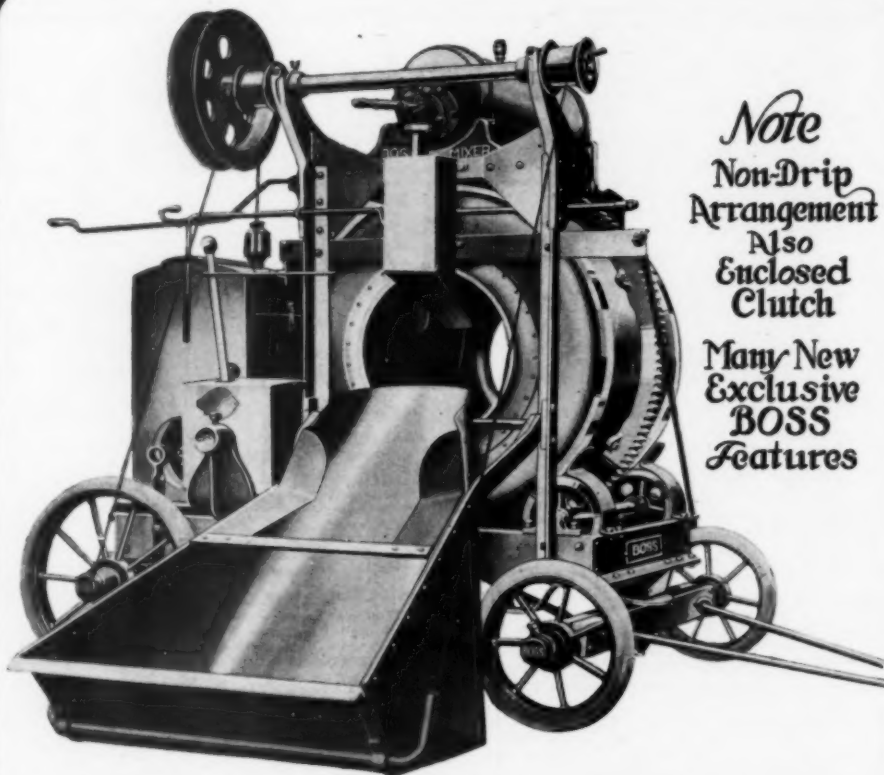
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Imperial Brass Mfg. Co., Chicago, Ill.
Mott Iron Wks., J. L., New York.

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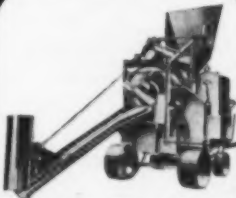
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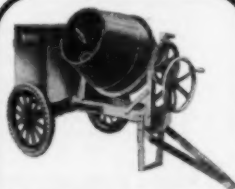
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Where to Purchase

9

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Berger Mfg. Co., Canton, O.
Canton Art Metal Co., Canton, O.
Globe Iron Roofing & Cor. Co., Cincinnati, O.
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Klauser Mfg. Co., Dubuque, Iowa.
Meeker & Co., Geo. L., Evansville, Ind.
Milwaukee Corrugating Co., Milwaukee, Wis.
Wheeling Corrugating Co., Wheeling, W. Va.

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*Pennsylvania Cement Co., New York.
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Allentown Portland Cement Co., Allentown, Pa.
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Ash Grove Lime and Portland Cement Co., Kansas City, Mo.
Atlas Portland Cement Co., New York.
Bath Portland Cement Co., Philadelphia, Pa.
Beaver Portland Cement Co., Portland, Ore.
Bessemer Limestone and Cement Co., Youngstown, O.
Canada Cement Co., Ltd., Montreal, Canada.
Cincinnati Portland Cement Corp., Kingsport, Tenn.
Colorado Portland Cement Co., Denver, Colo.
Cowell Portland Cement Co., San Francisco, Cal.
Crescent Portland Cement Co., Wampum, Pa.
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Dexter Portland Cement Co., Nazareth, Pa.
Diamond Portland Cement Co., Cleveland, Ohio.
Dixie Portland Cement Co., Chattanooga, Tenn.
Edison Portland Cement Co., New York.
Giant Portland Cement Co., Philadelphia, Pa.
Gilmore Portland Cement Corp., Gilmore City, Iowa.
Glens Falls Portland Cement Co., Glens Falls, N. Y.
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Hercules Cement Corp., Philadelphia, Pa.
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International Cement Corp., New York.
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Kosmos Portland Cement Co., Louisville, Ky.
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Lehigh Portland Cement Co., Allentown, Pa.
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Missouri Portland Cement Co., St. Louis, Mo.
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Nazareth Cement Co., Nazareth, Pa.
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New Egyptian Portland Cement Co., Fenton, Mich.
Northwestern States Portland Cement Co., Mason City, Ia.
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Oklahoma Portland Cement Co., Denver, Colo.
Olympic Portl'd Cement Co., Ltd., Seattle, Wash.
Oregon Portland Cement Co., Portland, Ore.
Pacific Portland Cement Co., San Francisco, Cal.
Peerless Portland Cement Co., Union City, Mich.
Peninsular Portland Cement Co., Cement City, Mich.
Penn-Allen Cement Co., Allentown, Pa.
Petokey Portland Cement Co., Petokey, Mich.
Phoenix Portland Cement Co., Nazareth, Pa.
Portland Cement Co. of Utah, Salt Lake City, Utah.
Pyramid Portland Cement Co., Des Moines, Ia.
Riverside Portl'd Cement Co., Los Angeles, Cal.
San Antonio Portland Cement Co., San Antonio, Tex.
Sandusky Cement Co., Cleveland, Ohio.
Santa Cruz Portland Cement Co., San Francisco, Cal.
Security Cement and Lime Co., Hagerstown, Md.

Signal Mountain Portland Cement Co., Chattanooga, Tenn.
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Wabash Portland Cement Co., Detroit, Mich.
Wolverine Portl'd Cement Co., Coldwater, Mich.
Wyandotte Portland Cement Co., Detroit, Mich.

CEMENT GUNS

Cement Gun Co., Allentown, Pa.

CEMENT INSPECTION (See Inspecting Laboratories)

CEMENT TOOLS

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CENTRIFUGAL PUMPS

(See "Pumps, Centrifugal")

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Columbus McKinnon Chain Co., Columbus, O.
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Link-Belt Co., Chicago, Ill.
U. S. Chain & Forge Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

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CHIMNEYS, STEEL (See Stacks, Steel)

CHLORINATORS

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Paradon Eng. Co., Long Island City, N. Y.

CHLORINE, LIQUID (See Liquid Chlorine)

CHUTES, CONCRETE

*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Engineering Co., Cleveland, O.
Ransome Concrete Mch'y. Co., Danellen, N. J.

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Marion Malleable Iron Works, Marion, Ind.
Mockbee & Co., C. M., Cincinnati, O.
Roebling Sons Co., J. A., Trenton, N. J.
Upson-Walton Co., Cleveland, O.

COAL AND ORE CONVEYING MACHINERY

*Barber-Greene Co., Aurora, Ill.
*Good Roads Mach'y Co., Kennett Square, Pa.

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 *Hais Mfg. Co., Geo., New York.
 *Lidgerwood Manufacturing Co., New York.
 *Mead-Morrison Mfg. Co., E. Boston, Mass.
 Bartlett & Snow Co., C. O. Cleveland, Ohio.
 Brown Hoisting Mch'y. Co., Cleveland, O.
 Chain Belt Co., Milwaukee, Wis.
 Fairfield Engineering Co., Lancaster, Ohio.
 Gifford-Wood Co., Hudson, N. Y.
 Hunt Co., Inc., C. W. West New Brighton, N. Y.
 Jeffrey Mfg. Co., Columbus, O.
 Kon-Wald Co., Buffalo, N. Y.
 Link-Belt Co., Chicago, Ill.
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 Robins Conv. Belt Co., New York
 Webster Mfg. Co., Chicago, Ill.
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 Chapman Valve Mfg. Co., Indian Orchard, Mass.
 Glanier Brass Mfg. Co., Cleveland, Ohio.
 Haydenville Co., Haydenville, Mass.
 Mueller Company, Decatur, Ill.

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 *Sterling Wheelbarrow Co., Milwaukee, Wis.
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 *Koehring Co., Milwaukee, Wis.
 *Kwik-Mix Concrete Mixer Co., Port Washington, Wis.
 *Lakewood Engineering Co., Cleveland, O.
 *Raber & Lang Mfg. Co., Kendallville, Ind.
 *Smith Co., T. L., Milwaukee, Wis.
 Badger Concrete Mixer Co., Milwaukee, Wis.
 Chain Belt Co., Milwaukee, Wis.
 Contractors' Equipment Co., Keokuk, Ia.
 B. M. Cropp Co., Chicago, Ill.
 Foote Concrete Mch'y. Co., Chicago, Ill.
 Gray Iron Fdry Co., Reading, Pa.
 Judy Mfg. Co., Centerville, Ia.
 Knickerbocker Co., Jackson, Mich.
 Lansing Co., Lansing, Mich.
 Leach Co., Oshkosh, Wis.
 Marsh-Capron Co., Chicago, Ill.
 Milwaukee Concrete Mixer Co., Milwaukee, Wis.
 Ransome Concrete Mch'y. Co., Dunellen, N. J.
 Republic Iron Works, Tecumseh, Mich.
 Schramm, Inc., West Chester, Pa.
 Standard Scale & Supply Co., Pittsburgh, Pa.
 Truckmixer Co., Milwaukee, Wis.
 Worthington Pump & Mach'y Corp., New York.
 CONCRETE PILING. (See Piling, Concrete)

CONCRETE REINFORCEMENT

*Truscon Steel Co., Youngstown, O.
 *Wickwire Spencer Steel Corp., New York.
 American Steel & Wire Co., Chicago, Ill.
 Bethlehem Steel Co., Bethlehem, Pa.
 Carnegie Steel Co., Pittsburgh, Pa.
 Concrete Steel Co., New York.
 Consolidated Expanded Metal Co., Braddock, Pa.
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 General Fireproofing Co., Youngstown, O.
 Inland Steel Co., Chicago, Ill.
 Kalman Steel Co., Chicago, Ill.
 Laclede Steel Co., St. Louis, Mo.
 National Steel Fabric Co., Pittsburgh, Pa.
 Ryerson & Son, J. T., Chicago, Ill.

Youngstown Pressed Steel Co., Warren, O.
 Youngstown Sheet & Tube Co., Youngstown, O.

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*Lakewood Engineering Co., Cleveland, O.
 Dunn Road Mach. Co., Conneaut, Ohio.
 French & Co., A. W., Chicago, Ill.
 Heltsel Steel Form & Iron Co., Warren, O.

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*Concrete Surfacing Mach'y. Corp., Cincinnati, O.

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 Turbine Sewer Machine Co., Milwaukee, Wis.
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American Circular Loom Co., New York.
 Central Tube Co., Pittsburgh, Pa.
 Clifton Mfg. Co., Boston, Mass.
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 Johns-Manville, Inc., New York.
 National Fireproofing Co., New York.

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 Bartlett & Snow Co., C. O. Cleveland, O.
 Caldwell & Son, H. W., Chicago, Ill.
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 Godfrey Conveyor Co., Elkhart, Ind.
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 Olson & Co., Sam'l, Chicago, Ill.
 Republic Rubber Co., Youngstown, O.
 Robins Conv. Belt Co., New York.
 Stephens Adamson Mfg. Co., Aurora, Ill.
 Webster Mfg. Co., Chicago, Ill.
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- *Bay City Dredge Wks., Bay City, Mich.
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- *Harnischfeger Corp., Milwaukee, Wis.
- *Industrial Works, Bay City, Mich.
- *Koehring Co., Milwaukee, Wis.
- *Osgood Co., The, Marion, O.
- *Thew Shovel Co., Lorain, O.
- American Hoist & Derrick Co., St. Paul, Minn.
- Brown Hoisting Mch. Co., Cleveland, O.
- Browning Co., Cleveland, O.
- Bucyrus Co., South Milwaukee, Wis.
- Davenport Locomotive Works, Davenport, Ia.
- Erie Steam Shovel Co., Erie, Pa.
- Hanna Eng. Works, Chicago, Ill.
- Link-Belt Co., Chicago, Ill.
- Locomotive Crane Co. of America, Champaign, Ill.
- Marion Steam Shovel Co., Marion, O.
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- Northwest Engineering Works, Chicago, Ill.
- Orton & Steinbrenner Co., Chicago, Ill.
- Ohio Locomotive Crane Co., Bucyrus, O.
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- Chesapeake Iron Wks., Baltimore, Md.
- Chisholm-Moore Mfg. Co., Cleveland, Ohio.
- Milwaukee Electric Crane Co., Milwaukee, Wis.
- Morgan Engineering Co., Alliance, O.
- Northern Eng. Works, Detroit, Mich.
- Shaw Crane Works, Muskegon, Mich.
- Shepard Elec. Cr. & Hst. Co., Montour Falls, N.Y.
- Toledo Crane Co., Bucyrus, O.
- Whiting Fdry. & Equip. Co., Harvey, Ill.

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- Universal Crane Co., Cleveland, Ohio

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- Buchanan Co., O. O., New York.
- Traylor Eng. & Mfg. Co., Allentown, Pa.

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- *Austin-Western Road Mach. Co., Chicago, Ill.
- *Good Roads Machy. Co., Kennett Square, Pa.
- *Universal Road Machinery Co., Kingston, N. Y.
- Chalmers & Williams, Chicago Hts., Ill.
- Gallon Iron Works & Mfg. Co., Gallon, Ohio
- Morgan Engineering Co., Alliance, O.
- New Holland Mach. Co., New Holland, Pa.
- Smith Eng. Wks., Milwaukee, Wis.
- Sturtevant Mill Co., Boston, Mass.
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- American Cast Iron Pipe Co., Birmingham, Ala.
- Gilbert Mfg. Co., Aberdeen, S. D.
- Wood & Co., R. D., Philadelphia, Pa.

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- Florida Metal Products Co., Jacksonville, Fla.
- Gallon Iron Works & Mfg. Co., Gallon, Ohio
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- Klauser Mfg. Co., Dubuque, Ia.
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- Newport Culvert Co., Newport, Ky.
- Northfield Iron Co., Northfield, Minn.
- Southern Metal Culvert Co., Salisbury, N. C.
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- Concrete Form Co., Inc., Syracuse, N. Y.
- Northfield Iron Co., Northfield, Minn.

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- Casey-Hedges Co., Chattanooga, Tenn.
- Clow & Sons, J. B., Chicago, Ill.
- Madison Foundry Co., Cleveland, O.
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- *Godwin Co., W. S., Baltimore, Md.

CURE, STEEL PROTECTED

- *Truscon Steel Co., Youngstown, O.
- Concrete Steel Co., New York.
- Steel Protected Concrete Co., Philadelphia, Pa.

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- *Solvay Process Co., New York

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- Oswego Tool Co., Oswego, N. Y.
- Reed Mfg. Co., Erie, Pa.
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- *Koehring Co., Milwaukee, Wis.
- Buffalo Forge Co., Buffalo, N. Y.
- Carolus Mfg. Co., Sterling, Ill.
- Helwig Mfg. Co., St. Paul, Minn.
- Worthington Pump & Mch. Corp., New York.

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- Shunk Mfg. Co., Bucyrus, O.

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- MacLeod Co., Cincinnati, O.
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- *Clyde Iron Wks. Sales Co., Duluth, Minn.
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- *Flory Mfg. Co., S., Bangor, Pa.
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- American Hoist & Derrick Co., St. Paul, Minn.
- Federal Bridge & Struc. Co., Waukesha, Wis.
- Horton Co., John T., New York.
- Lakeside Bridge & Steel Co., N. Milwaukee, Wis.
- National Hoisting Engine Co., Harrison, N. J.
- Saugen Derrick Co., Chicago, Ill.
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THAT average sized concrete job—from 200 to 3,000 cubic yards—not enough concrete to warrant erecting a steel tower, and yet you need the speed and economy of chute distribution, and can use to advantage the desirable features of a steel tower plant.

The answer is the Insley Steel Mast Boom Plant, for a 7-S or 14-S mixer. It can be bought, set up, and taken down for what it costs to buy a bucket and hopper and BUILD a wood tower.

It provides a system of self-supporting chutes. By means of a sliding frame, the chute assembly can be quickly shifted to any position on the mast. The plant, being made of steel has practically no depreciation.

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Every concrete job is not a "chuting" job. But in the majority of cases, there IS a chuting plant layout that can profitably be used. Insley Engineers stand ready at all times to show you how Insley Equipment will place your concrete to the greatest advantage. Consult them without obligation.

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*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
*Lidgerwood Manufacturing Co., New York
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*Bay City Dredge Works, Bay City, Mich.
*Clyde Iron Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
American Hoist & Derrick Co., St. Paul, Minn.
Austin Machinery Corp'n, Muskegon, Mich.
Hayward Co., New York.
Nat'l Hoisting Engine Co., Harrison, N. J.
Orton & Steinbrenner Co., Chicago, Ill.

DIESEL ENGINES. (See Engines, Oil)

DISTRIBUTORS, TAR AND ASPHALT

*Kinney Mfg. Co., Boston, Mass.

DISTRIBUTING PLANTS, CONCRETE

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*Lakewood Engineering Co., Cleveland, O.
*Insley Mfg. Co., Indianapolis, Ind.
Ransome Concrete Mch'y. Co., Danellen, N. J.

DITCHING MACHINES. (See Excavators, Ditch and Trench)

DIVIDING PLATES (ROAD)

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DOORS, HOLLOW METAL

Art Metal Const'n Co., Jamestown, N. Y.
Dahlstrom Metallic Door Corp., Jamestown, N. Y.
Lawton-Stephens Co., Brooklyn, N. Y.
McFarland Co., J. C., La Porte, Ind.
United Metal Products Co., Canton, Ohio.

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Variety Fire Door Co., Chicago, Ill.
Wilson Corp., J. G., New York.

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Universal Drafting Machine Co., Cleveland, O.

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*T. Rowland's Sons, Inc., Cheltenham, Pa.
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*Wright Shovel Co., Anderson, Ind.

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*Lidgerwood Manufacturing Co., New York
*Michigan Dredge Co., Bay City, Mich.
*Osgood Co., The, Marion, O.
American Steel Dredge Co., Fort Wayne, Ind.
Bucyrus Co., South Milwaukee, Wis.
Ellicott Machine Corp'n, Baltimore, Md.
Erie Steam Shovel Co., Erie, Pa.
Hayward Co., New York.
Marion Steam Shovel Co., Marion, O.
Stockton Iron Works, Stockton, Cal.
Street Bros. Machine Works, Chattanooga, Tenn.
Superior Iron Works, Superior, Wis.

DREDGES, DIPPER

*Bay City Dredge Works, Bay City, Mich.
*Osgood Co., Marion, O.
American Steel Dredge Co., Fort Wayne, Ind.
Austin Machinery Corp'n, Muskegon, Mich.
Bucyrus Co., South Milwaukee, Wis.
Fairbanks Steam Shovel Co., Marion, O.
Marion Steam Shovel Co., Marion, O.

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Bucyrus Co., South Milwaukee, Wis.
Ellicott Mach. Corp., Baltimore, Md.
Fairbanks Steam Shovel Co., Marion, O.
Marion Steam Shovel Co., Marion, O.
Morris Machine Works, Baldwinville, N. Y.

DREDGING PUMPS AND ACCESSORIES

Erie Pump & Engine Wks., Medina, N. Y.

DRILLS, AIR AND ROCK

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*Denver Rock Drill Mfg. Co., Denver, Colo.
*McKiernan-Terry Drill Co., New York.
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Cleveland Pneumatic Tool Co., Cleveland, Ohio.
Cleveland Rock Drill Co., Cleveland, Ohio.
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Independent Pneumatic Tool Co., Chicago, Ill.
Ingersoll-Rand Co., New York.

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(See Well Drilling Machinery)

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Bartlett & Snow Co., C. O., Cleveland, O.
Cummer & Son Co., F. D., Cleveland, O.
Ruggles-Coles Eng. Co., New York.

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Jennings Automatic Dump Body, Roanoke, Va.
Lee Trailer & Body Co., Chicago, Ill.
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Gilbert Mfg. Co., Aberdeen, E. D.
Holsborg & Bro., Geo. H., Jeffersonville, Ind.
Little Red Wagon Co., Omaha, Neb.
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Weller Mfg. Co., Chicago, Ill.
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Llewellyn Iron Works, Los Angeles, Cal.
Montgomery Elevator Co., Moline, Ill.
Otis Elevator Co., New York.
Ridgeway & Son Co., C. Coatesville, Pa.
See Elec. Elevator Co., A. B., New York.
Speidel, J. G., Reading, Pa.
Warner Elevator Mfg. Co., Cincinnati, O.
Warsaw Elevator Co., Warsaw, N. Y.

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*Alamo Engine Co., Hillsdale, Mich.
*Climax Engineering Co., Clinton, Ia.
*Domestic Engine & Pump Co., Shippensburg, Pa.
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*Holt Mfg. Co., Peoria, Ill.
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Evinrude Motor Co., Milwaukee, Wis.
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Fuller & Johnson Mfg. Co., Madison, Wis.
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Hercules Motors Corp., Canton, O.
John Lanson Mfg. Co., New Holstein, Wis.
Le Roi Co., Milwaukee, Wis.
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Universal Motor Co., Oshkosh, Wis.
Weber Engine Co., Kansas City, Mo.
Wellman-Seaver-Morgan Co., Cleveland, O.
Worthington Pump & Mch'y. Corp., New York.

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*Climax Engineering Co., Clinton, Iowa

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Nordberg Mfg. Co., Milwaukee, Wis.
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Buckeye Machinery Co., Lima, O.
Charter Gas Eng. Co., Sterling, Ill.
Chicago Pneumatic Tool Co., New York.
De La Vergne Machine Co., New York.
Fairbanks, Morse & Co., Chicago, Ill.
Foss Gas Engine Co., Springfield, Ohio.
Ingersoll-Rand Co., New York.
Midwest Engine Co., Indianapolis, Ind.
Muncie Oil Eng. Co., Muncie, Ind.
Nordberg Mfg. Co., Milwaukee, Wis.
St. Mary's Oil Eng. Co., St. Charles, Mo.
Stover Mfg. & Engine Co., Freeport, Ill.
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Weber Engine Co., Kansas City, Mo.
Worthington Pump & Mch'y. Corp., New York.

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Hoover, Owens, Rentschler Co., Hamilton, O.
Murray Iron Wks., Burlington, Ia.
Nordberg Mfg. Co., Milwaukee, Wis.
Worthington Pump & Mch'y. Corp., New York.

ENGINES, STEAM

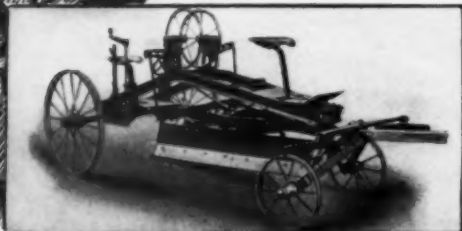
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Dake Engine Co., Grand Haven, Mich.
Erie-Ball Engine Co., Pittsburgh, Pa.
Erie Pump & Engine Co., Medina, N. Y.
Filer-Stowell Co., Milwaukee, Wis.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Lefell Co., J., Springfield, O.
Morris Machine Works, Baldwinville, N. Y.
Murray Iron Works Co., Burlington, Ia.
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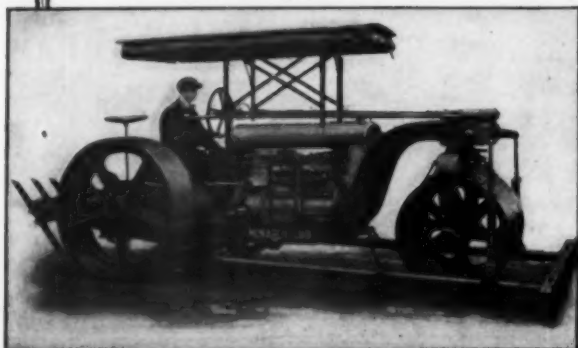
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*Insley Mfg. Co., Indianapolis, Ind.
*Keystone Driller Co., Beaver Falls, Pa.
*Osgood Co., The, Marion, O.
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Erie Steam Shovel Co., Erie, Pa.
Fairbanks Steam Shovel Co., Marion, O.
Hayward Co., The, New York City.
Marion Steam Shovel Co., Marion, O.
Monighan Machine Co., Chicago, Ill.
Parsons Co., Newton, Ia.
Topping Machy. Co., Chas. T. Dayton, O.

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*Bay City Dredge Works, Bay City, Mich.
*Byers Machine Co., Ravenna, Ohio.
*Clyde Iron Wks. Sales Co., Duluth, Minn.
*Green, L. P., Chicago, Ill.
*Harnischfeger Corp., Milwaukee, Wis.
*Industrial Works, Bay City, Mich.
*Osgood Co., The, Marion, O.
*Sauerman Bros., Chicago, Ill.
*Smith Co., T. L., Milwaukee, Wis.
Austin Machinery Corp'n., Muskegon, Mich.
Gallon Iron Works & Mfg. Co., Gallon, Ohio.
Browning Co., Cleveland, O.
Bucyrus Co., South Milwaukee, Wis.
Economy Excavator Co., Iowa Falls, Ia.
Erie Steam Shovel Co., Erie, Pa.
Gade Excavator Works, O. L., Iowa Falls, Iowa.
Hayward Co., New York.
Link-Belt Co., Chicago, Ill.
Marion Steam Shovel Co., Marion, O.
Monighan Machine Co., Chicago, Ill.
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*Barrett Co., New York
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*Texas Company, New York.
*Truscon Steel Co., Youngstown, O.
*Waring-Underwood Co., Philadelphia, Pa.
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Pioneer Asphalt Co., Lawrenceville, Ill.
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Du Pont de Nemours & Co., E. I., Wilmington, Del.
Giant Powder Co., Cons., San Francisco, Cal.
Grassell Powder Co., Cleveland, O.
Hercules Powder Co., Wilmington, Del.

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*Wickwire Spencer Steel Corp., New York.
Adrian Wire Fence Co., Adrian, Mich.
American Steel & Wire Co., Chicago, Ill.
Anchor Post Iron Works, New York.
Cyclone Fence Co., Waukegan, Ill.
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Nitselman Bros., Muncie, Ind.
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Pittsburgh Steel Co., Pittsburgh, Pa.
Texas Cyclone Fence Co., Fort Worth, Tex.
Youngstown Sheet & Tube Co., Youngstown, O.

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Berger Mfg. Co., Canton, O.
General Fireproofing Co., Youngstown, O.
Van Dorn Iron Works, Cleveland, O.

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Hale Fire Pump Co., Conshohocken, Pa.
Northern Fire Apparatus Co., Minneapolis, Minn.
Obenchain-Boyer Co., Logansport, Ind.
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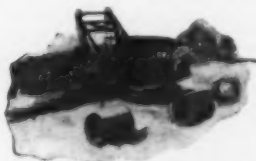
Many contractors could have increased their profits on last year's jobs—many will resolve to replace inefficient equipment during 1925—reduce expensive delays—many will forget this, however, and go through another year with lower profits than they really should have.

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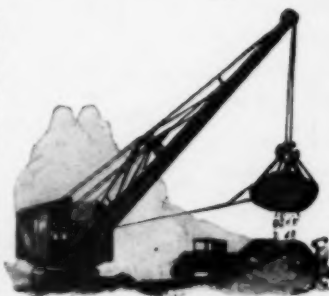
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P & H Excavators will help you more than ever because competition makes close figuring necessary. And whether close figures are required or not—P & H equipment, economical, dependable day in and day out—puts dollars in your pocket.



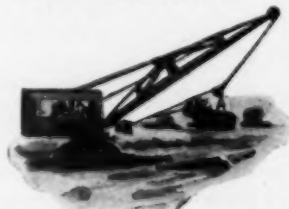
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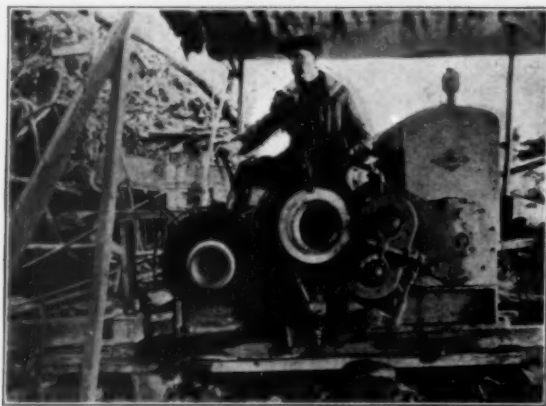
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CLYDE

Standard Hoists and Derricks
For the General Contractor
STEAM · ELECTRIC · GASOLINE · BELT



TWO WEEKS CONTINUOUS OPERATION!

The Clyde Company received the above picture and the letter herewith which was written February 18, and sent in voluntarily by the writer. It is self-explanatory:

"I have been operating a Clyde Hoist at Sand Cave, Cave City, Ky., helping to get Floyd Collins out of the cave. There were people, lots of them, that came to me every day while I was there and spoke to me and none failed to mention the true, smooth efficiency with which the engine ran. It has been there over two weeks now running day and night, only stopping a few moments in each 24 hours for a test to determine if Collins was living and also the progress we were making and how near him we were getting.

"Your hoist was selected out of several others that were sent to this place. It was sent here by the Foster, Creighton Co., of Nashville, Tenn., and selected and set up by Tom Smith. I talked to Mr. Smith concerning the hoist this morning when I asked him what he thought of it. He said it was the most complete one he ever saw and added when we are in need of hoisting machinery again, I expect to consult them. Mr. Smith is M. M. for the Ky. Rock Asphalt Co., Kentucky Rock, Ky. I am employed by this Company as Hoisting Engineer.

"If I should ever be called on to recommend one of your hoists, I can safely say they are the best."

L. H. CROSS.

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The Barber-Greene which replaced 12 men at handling sand and stone for the Warren Bituminous Paving Co. In 10 hours it loaded 378 loads, of 18 cubic feet each.

Two Barber-Greenes at the central mixing plant of Hans Jensen, St. Charles, Ill., have displaced a shovel gang of 17 men.



This Barber-Greene Bucket Loader replaced 12 men at handling stone on a road job for the State of Illinois. Materials were stored in advance.



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Feeding stuff into the charging end of a mixer is the best and only way to keep concrete pouring out of the discharge end. The problem is to have a fresh batch ready each time the skip drops—at the lowest possible costs.

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They save the cost and time of shipping, erecting, taking down, and licking trouble on expensive material handling systems. The moment the job is ready the Barber-Greenes are ready.

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"Contracting with Barber-Greenes" is the latest Barber-Greene collection of material-handling layouts on road and street paving jobs. It shows the new systems that contractors have developed during 1924. These are bound to be of interest to all contractors, so just mail your request to address below. We'll see that you get a copy.

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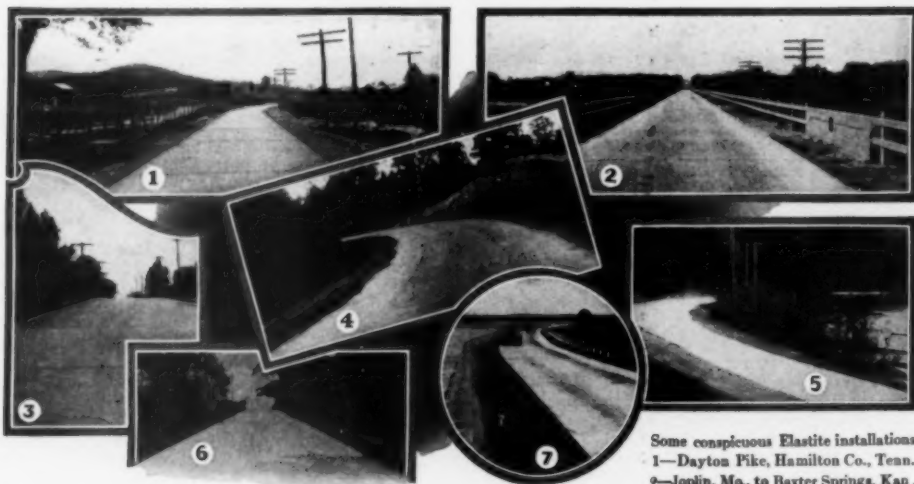
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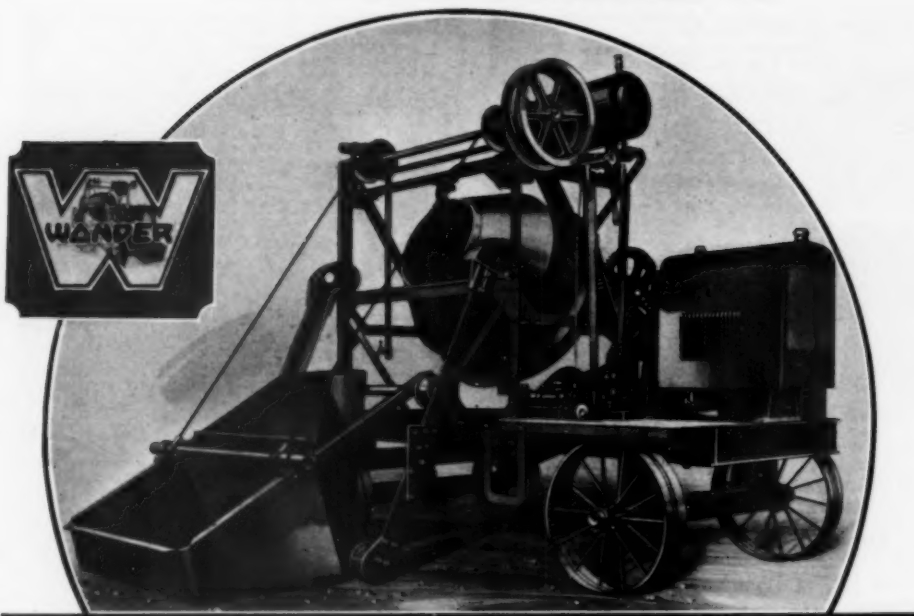
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Patterson-Williams Co., San Jose, Calif.
Spalding & Bros., A. G., Chicopee, Mass.
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Smith & Sons Mfg. Co., Kansas City, Mo.
Western Wheeler Scraper Co., Aurora, Ill.
Wiard Plow Co., Batavia, N. Y.

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Crane Co., Chicago, Ill.
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Mott Iron Wks., J. L., New York.
Mueller Company, Decatur, Ill.
Rundie-Spence Mfg. Co., Milwaukee, Wis.
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Walworth Mfg. Co., Boston, Mass.

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PORTLAND CEMENT. (See Cement.)

POWDER. (See Explosives.)

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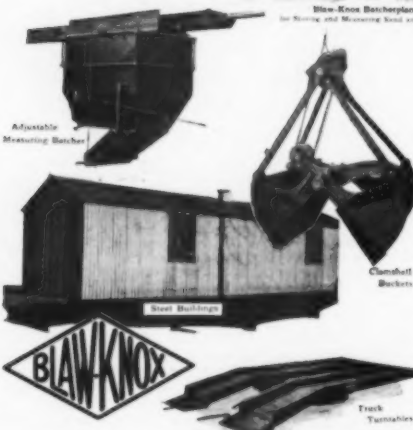
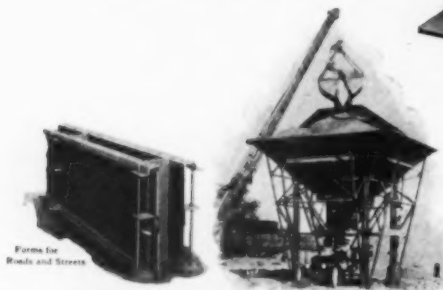
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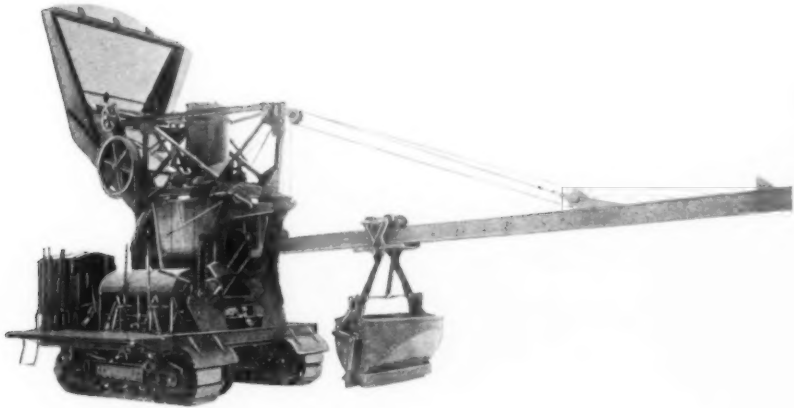
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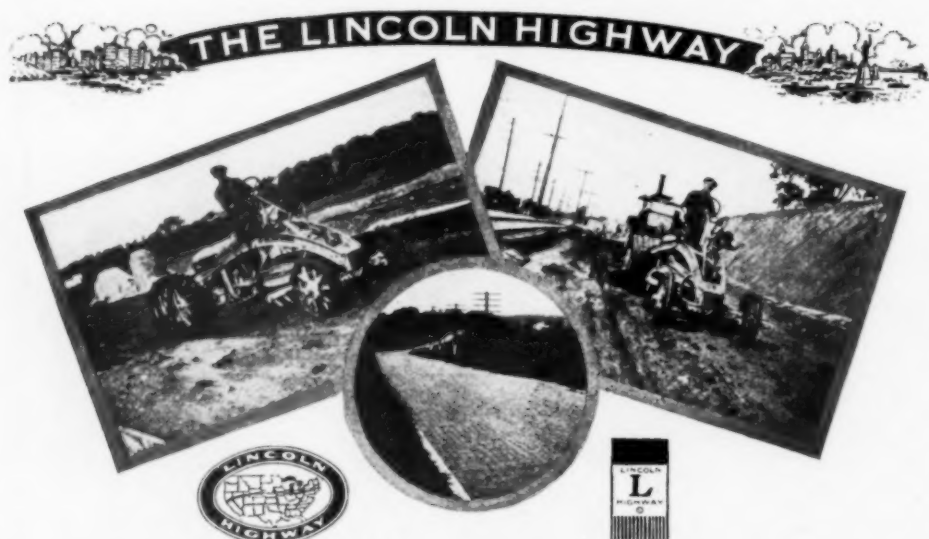
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"I have built roads for a number of years and have used all kinds of equipment, but must say that the Hadfield-Penfield One-Man Grader is the best tool that I have ever used.

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That is one man's opinion backed by facts. We can match it with a hundred like it, and so can you. Sell a man a Hadfield-Penfield and he will be a salesman without knowing it. The pictures show the Huber job.

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Northfield Iron Co., Northfield, Minn.
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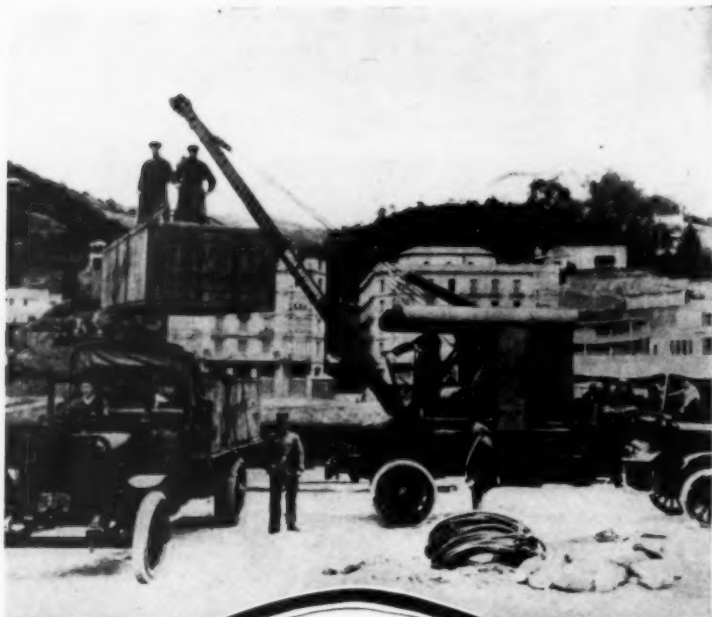
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- Berger Mfg. Co., Canton, O.
- Edwards Mfg. Co., Cincinnati, O.
- Klauser Mfg. Co., Dubuque, Ia.
- Milwaukee Corrugating Co., Milwaukee, Wis.
- Nat'l Sheet Metal Roofing Co., Jersey City, N. J.
- United Alloy Steel Corp'n., Canton, O.
- Youngstown Sheet & Tube Co., Youngstown, O.

ROOFING KETTLES. (See Kettles)

ROPE, MANILA

- American Mfg. Co., Brooklyn, N. Y.
- Columbian Rope Co., Auburn, N. Y.
- Cupples Cordage Co., Brooklyn, N. Y.
- Hooven & Allison Co., Xenia, O.
- Kelly Co., R. A., Xenia, O.
- New Bedford Cordage Co., New Bedford, Mass.
- Peoria Cordage Co., Peoria, Ill.
- Plymouth Cordage Co., N. Plymouth, Mass.
- Wall Rope Wks., New York.
- Waterbury Co., New York.
- Whitlock Cordage Co., New York.

ROPE, WIRE, HOISTING, HAULAGE

- *Wickwire Spencer Steel Corp., New York.
- *Williamsport Wire Rope Co., Williamsport, Pa.
- American Steel & Wire Co., Chicago, Ill.
- Broderick & Bascom Rope Co., St. Louis, Mo.
- Leschen & Sons Rope Co., A., St. Louis, Mo.
- MacWhite Co., Kenosha, Wis.
- Moon Co., Geo. C., Garwood, N. J.
- Roebbing's Sons Co., J. A., Trenton, N. J.
- Upson-Walton Co., Cleveland, O.
- Waterbury Co., New York.

RUBBER TIRES. (See Tires.)

RULES

- *Lufkin Rule Co., Saginaw, Mich.

SAFETY TREADS. (See Treads, Safety)

SASH, ROLLER STEEL. (See Window Frames and Sash)

SAW RIGS, PORTABLE

- *Amer. Saw Mill Mach. Co., Hackettstown, N. J.
- C. H. & E. Manufacturing Co., Milwaukee, Wis.
- Knickerbocker Co., Jackson, Mich.
- Lesch Co., Oshkosh, Wis.

SCARIFIERS

- *Acme Road Mach. Co., Frankfort, N. Y.
- *Austin Western Road Machy. Co., Chicago, Ill.
- *Barber Asphalt Co., Philadelphia, Pa.
- *Buffalo Springfield Roller Co., Springfield, O.
- *Good Roads Mach. Co., Kennett Square, Pa.
- *Huber Mfg. Co., Marion, O.
- *Kinney Mfg. Co., Boston, Mass.
- *Russell Grader Mfg. Co., Minneapolis, Minn.
- *Shaw-Enochs Tractor Co., Minneapolis, Minn.
- *Spears-Weills Machy. Co., Oakland, Cal.
- *Universal Road Machinery Co., Kingston, N. Y.
- Adams & Co., J. D., Indianapolis, Ind.
- Case Threshing Mach. Co., J. I., Racine, Wis.
- Gallion Iron Works & Mfg. Co., Gallion, Ohio
- Gilbert Mfg. Co., Aberdeen, S. Dak.
- Lyle Cul. & Rd. Equip. Co., Minneapolis, Minn.
- Stockland Road Machy. Co., Minneapolis, Minn.

SCARIFIERS, TEETH FOR

- Shunk Mfg. Co., Bucyrus, Ohio

SCOOPS

- *Oliver Ames & Sons Corp., North Easton, Mass.
- *Ames Shovel & Tool Co., Boston, Mass.
- *Geo. Griffiths Co., Cheltenham, Pa.
- *The H. M. Myers Co., Beaver Falls, Pa.
- *T. Rowland's Sons, Inc., Cheltenham, Pa.
- *St. Louis Shovel Co., Plant, St. Louis, Mo.
- *Wright Shovel Co., Anderson, Ind.

SCRAPERS, DRAGLINE

- *Sauerman Bros., Chicago, Ill.

SCRAPERS, POWER DRAG

- *L. P. Green, Chicago, Ill.
- *Sauerman Bros., Chicago, Ill.

SCRAPERS, ROAD (See Road Scrapers)

SCRAPERS, SELF-LOADING

- *Baker Mfg. Co., Springfield, Ill.
- *Shaw-Enochs Tractor Co., Minneapolis, Minn.

SCREENS, SAND, GRAVEL AND COAL

- *Atlas Eng. Co., Milwaukee, Wis.
- *Austin-Western Road Machy. Co., Chicago, Ill.
- *Good Roads Mach'y Co., Kennett Square, Pa.
- *L. P. Green, Chicago, Ill.
- *Hais Mfg. Co., New York.
- *Littleford Bros., Cincinnati, O.
- *Russell Grader Mfg. Co., Minneapolis, Minn.
- *Universal Road Machinery Co., Kingston, N. Y.
- *Wickwire Spencer Steel Corp., New York.
- Allis-Chalmers Mfg. Co., Milwaukee, Wis.
- Austin Mfg. Co., Chicago, Ill.
- C. O. Bartlett & Snow Co., Cleveland, Ohio.
- Case Threshing Machine Co., J. I., Racine, Wis.
- Chain Belt Co., Milwaukee, Wis.
- Gallion Iron Wks. & Mfg. Co., Gallion, Ohio.
- Gifford-Wood Co., Hudson, N. Y.
- Hendrick Mfg. Co., Carbondale, Pa.
- Jeffrey Mfg. Co., Columbus, O.
- Link-Belt Co., Chicago, Ill.
- Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
- Newaygo Eng. Co., Newaygo, Mich.
- New Jersey Wire Cloth Co., Trenton, N. J.
- Robins Conv. Belt Co., New York.
- Sackett Screen & Chute Co., H. B., Chicago, Ill.
- Webster Mfg. Co., Chicago, Ill.
- Weller Mfg. Co., Chicago, Ill.

SCREENS, SEWAGE

- Green Bay Fdry. & Mach Wks., Green Bay, Wis.
- Link-Belt Co., Philadelphia, Pa.
- Sanitation Corp'n., New York.
- Simplex Ejector Co., Chicago, Ill.

SEWAGE DISPOSAL APPARATUS

- *Pacific Flush Tank Co., Chicago, Ill.
- Dorr Co., New York.
- Sanitation Corp'n., New York.
- Simplex Ejector Co., Chicago, Ill.

SEWAGE PUMPS (See "Pumps, Centrifugal")

SEWAGE EJECTORS

- *Pacific Flush Tank Co., Chicago, Ill.
- Sanitation Corp'n., New York.
- Simplex Ejector Co., Chicago, Ill.
- Yeomans Bros. Co., Chicago, Ill.

SEWER BLOCKS, SEGMENT

- American Vit. Products Co., Akron, O.
- Cannelton Sewer Pipe Co., Cannelton, Ind.
- Denver Sewer Pipe & Clay Co., Denver, Col.
- Evans & Howard Fire Brick Co., St. Louis, Mo.
- Dickey Clay Mfg. Co., W. S., Kansas City, Mo.
- Laclede Christy Clay Products Co., St. Louis, Mo.
- Macomb Sewer Pipe Wks., Macomb, Ill.
- Pacific Clay Products Co., Los Angeles, Cal.
- Red Wing Sewer Pipe Co., Red Wing, Minn.
- Robinson Clay Products Co., Akron, O.
- Standard Fire Brick & Sewer Pipe Co., Pueblo, Col.

SEWER CLEANING APPARATUS

- Champion Corporation, Hammond, Ind.
- Self Propelling Nozzle Co., New York.
- Turbine Sewer Machine Co., Milwaukee, Wis.

SEWER PIPE AND DRAIN TILE

- American Vit. Products Co., Akron, O.
- Blackner & Post Pipe Co., St. Louis, Mo.
- Dee Co., Wm. E., Chicago, Ill.
- Delaware Clay Products Co., Pittsburgh, Pa.
- Dickey Clay Mfg. Co., W. S., Kansas City, Mo.
- Denver Sewer Pipe & Clay Co., Denver, Col.
- National Fireproofing Co., Pittsburgh, Pa.
- Ohio Vitrified Pipe Co., Uhrichsville, O.
- Robinson Clay Products Co., Akron, O.

SEWER BODS

- Bissell Co., F., Toledo, O.
- Champion Corporation, Hammond, Ind.
- P. J. Healy, New York.
- Luck Sewer Equip. Co., Chicago, Ill.
- Turbine Sewer Machine Co., Milwaukee, Wis.

SHINGLES, METAL

- Berger Mfg. Co., Canton, Ohio.
- Canton Art Metal Co., Canton, Ohio.
- Edwards Mfg. Co., Cincinnati, Ohio.
- Eller Mfg. Co., Canton, Ohio.
- Milwaukee Corrugating Co., Milwaukee, Wis.
- Nat'l Sheet Metal Roofing Co., Jersey City, N. J.
- Newport Rolling Mill Co., Newport, Ky.
- Penn Metal Co., Boston, Mass.
- Klauser Mfg. Co., Dubuque, Ia.

* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

*Three views of
Smith Paver
owned by the
Diets Construction
Co., Florula, Ala.*



There is no super-structure or top frame in the Smith design. Every stress, whether from the loaded boom, skip hoist, drum or traction, is taken by the entire frame—thereby minimizing vibration and loosening of bolts and the consequent weakening of the machine. The low frame means a more compact unit, lower center of gravity and greater endurance. The Smith can be shipped anywhere without dismantling as it will clear any R. R. trestle or city raised track.

Ask Any Contractor Who Owns One

No page of road building history is complete without its story of Smith Paver accomplishment. For years Smiths have been making records of speed, accuracy and endurance, and time and again they have proven by their economy of operation and length of service that they are quality pavers without equal.

Their low overall height, simple one-man control, speedy power discharge, full-length traction—all are features that mean efficiency in paver operation.

The result is that the Smith is a paver the contractor wants. Not only is it simple and easy to handle, but it is ruggedly built to stand continuous heavy duty throughout a long life.

Ask Any Contractor Who Owns One

THE T. L. SMITH COMPANY
1030 32nd Street, Milwaukee, Wis.
Sales Offices and Service Stations in All Principal Cities.

SMITH PAVERS

Where to Purchase

43

Timn Art Metal Co., Timn, Ohio.
Wheeling Metal Mfg. Co., Wheeling, W. Va.

SHOES

The O. D. G. Co., Owensboro, Ky.
 Roos Co., H. W., Cincinnati, O.
 Roos-Meyer-Hecht Co., Cincinnati, O.
 Symonds Clamp & Mfg. Co., Chicago, Ill.
 Universal Form Clamp Co., Chicago, Ill.

SHOVELS, ELECTRIC

*Bay City Dredge Works, Bay City, Mich.
 *Koehring Co., Milwaukee, Wis.
 *Osgood Co., Marion, Ohio
 *Thew Shovel Co., Lorain, O.
 Bucyrus Co., South Milwaukee, Wis.
 Marion Steam Shovel Co., Marion, O.

SHOVELS, GASOLINE

*Bay City Dredge Works, Bay City, Mich.
 *Harnischfeger Corp., Milwaukee, Wis.
 *Koehring Co., Milwaukee, Wis.
 *Osgood Co., Marion, Ohio
 *Thew Shovel Co., Lorain, O.
 American Steel Dredge Co., Fort Wayne, Ind.
 Austin Machinery Corp'n, Muskegon, Mich.
 Bucyrus Co., So. Milwaukee, Wis.
 Fairbanks Steam Shovel Co., Marion, O.
 Marion Steam Shovel Co., Marion, O.
 Orton & Steinbrenner Co., Chicago, Ill.

SHOVELS, HAND

*Oliver Ames & Sons Corp., North Easton, Mass.
 *Ames Shovel & Tool Co., Boston, Mass.
 *Geo. Griffiths Co., Cheltenham, Pa.
 *The H. M. Myers Co., Beaver Falls, Pa.
 *T. Rowland's Sons, Inc., Cheltenham, Pa.
 *St. Louis Shovel Co., Plant, St. Louis, Mo.
 *Wright Shovel Co., Anderson, Ind.
 Beall Bros. Co., Alton, Ill.
 Conneaut Shovel Co., Conneaut, O.
 Hubbard & Co., Pittsburgh, Pa.
 Indiana Shovel Co., New Castle, Ind.
 Jackson Shovel Co., Montpelier, Ind.
 Pittsburgh Shovel Co., Pittsburgh, Pa.
 Russell Shovel Co., Alliquippa, Pa.
 Stevens-Webb Co., Inc., Altoona, Pa.
 Union Furnace Mfg. Co., Altoona, Pa.
 Wood Shovel & Tool Co., Piqua, Ohio.
 Wyoming Shovel Works, Wyoming, Pa.

SHOVELS, STEAM

*Byers Machine Co., J. F., Ravenna, Ohio.
 *Industrial Works, Bay City, Mich.
 *Keystone Driller Co., Beaver Falls, Pa.
 *Osgood Co., The, Marion, O.
 *Thew Shovel Co., Lorain, O.
 Austin Machinery Corp'n, Muskegon, Mich.
 Bellwood Steam Shovel Co., Bellwood, Pa.
 Browning Co., Cleveland, O.
 Bucyrus Co., South Milwaukee, Wis.
 Erie Steam Shovel Co., Erie, Pa.
 Fairbanks Steam Shovel Co., Marion, O.
 Marion Steam Shovel Co., Marion, O.
 Orton & Steinbrenner Co., Chicago, Ill.

SIGNS, STREET AND ROAD

Auto Sign Display Co. of Mo., St. Louis, Mo.
 Automatic Signal & Sign Co., Chicago, Ill.
 Baltimore Enamel & Novelty Co., Baltimore, Md.
 Cavanaugh Bros. & Co., New York
 Century Sign Co., Boston, Mass.
 Elkhart Fdry. & Mach. Co., Elkhart, Ind.
 Ingram-Richardson Mfg. Co., Beaver Falls, Pa.
 Lyle-Signa, Minneapolis, Minn.
 Municipal Street Sign Co., New York.
 Nelke Sign Co., J. L., New York.
 Union Iron Products Co., East Chicago, Ind.
 Western Display & Mfg. Co., St. Paul, Minn.

SIGNS, TRAFFIC

Adams & Westlake, Chicago, Ill.
 Auto Sign Display Co. of Mo., St. Louis, Mo.
 Automatic Signal & Sign Co., Chicago, Ill.
 American Gas Accumulator Co., Elizabeth, N. J.
 Elkhart Fdry. & Mach. Co., Elkhart, Ind.
 Esco Mfg. Co., Peoria, Ill.
 General Electric Co., Schenectady, N. Y.
 Griswold Safety Signal Co., Minneapolis, Minn.
 King & Smith Co., Milwaukee, Wis.
 Lebanon Machine Co., Lebanon, N. H.
 Line Material Co., So. Milwaukee, Wis.
 Little Giant Co., Mankato, Minn.
 Lyle-Signa, Minneapolis, Minn.
 Ohio Traffic Devices Co., Columbus, O.
 Traffic Sign & Signal Co., Gloucester, Mass.
 Traffic Signal Corp., New York.
 Union Iron Products Co., E. Chicago, Ind.

SLATE, ROOFING

Vendor Slate Co., Inc., Easton, Pa.

SLATE, STRUCTURAL

Keenan Structural Slate Co., Bangor, Pa.
 Penna. Structural Slate Co., Easton, Pa.
 Phoenix Slate Co., Windgap, Pa.
 Structural Slate Co., Pen Argyl, Pa.

SLEEVES, TAPPING AND VALVE

Mueller Company, Decatur, Ill.
 Rensselaer Valve Co., Troy, N. Y.
 Smith Mfg. Co., A. F., East Orange, N. J.

SLUICE GATES. (See Gates, Sluice)

SMOKE STACKS. (See Stacks, Steel)

SNOW CLEANING MACHINERY

*Austin-Western Road Machy. Co., Chicago, Ill.
 *Baker Mfg. Co., Springfield, Ill.
 *Barber-Greene Co., Aurora, Ill.
 *Good Roads Mach. Co., Kennett Square, Pa.
 *Helt Mfg. Co., Peoria, Ill.
 *Mack Trucks, Inc., New York.
 *Monarch Tractors, Inc., Watertown, Wis.
 *Shaw-Enoch's Tractor Co., Minneapolis, Minn.
 Cleveland Tractor Co., Cleveland, Ohio.
 Toy Co., W. M., Sidney, Ohio.
 Union Iron Wks., Inc., Bangor, Me.
 Owensboro Ditcher & Grader Co., Owensboro, Ky.

SPADES (See Shovels)

SPRAYERS, ASPHALT AND TAR

*Kinney Mfg. Co., Boston, Mass.

SPRAYING MACHINERY FOR TREES

Bean Spray Pump Co., Lansing, Mich.
 Deming Co., The, Salem, Ohio.
 Field Force Pump Co., Elmira, N. Y.
 Fitzhenry-Guptill Co., East Cambridge, Mass.

SPREADERS, STONE

*Austin-Western Road Machy. Co., Chicago, Ill.
 *Burch Plow Works Co., Crestline, O.
 *Shaw-Enoch's Tractor Co., Minneapolis, Minn.

STACKS, STEEL

*Blaw-Knox Co., Pittsburgh, Pa.
 *Connery & Co., Inc., Philadelphia, Pa.
 *Hell Co., The, Milwaukee, Wis.
 *Littleford Bros., Cincinnati, O.
 Birmingham Tank Co., Birmingham, Ala.
 Chatta. Boiler & Tank Co., Chattanooga, Tenn.
 Chicago Bridge & Iron Works, Chicago, Ill.
 Honhorst Co., Jos., Cincinnati, Ohio.
 Petroleum Iron Works Co., Sharon, Pa.
 Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
 Scaife & Sons Co., Wm. B., Pittsburgh, Pa.
 Walsh & Weldner Boiler Co., Chattanooga, Tenn.
 STANDPIPES, TANKS AND TOWERS
 *Connery & Co., Inc., Philadelphia, Pa.
 Caldwell Co., W. E., Louisville, Ky.
 Chattanooga Blr. & Tank Co., Chattanooga, Tenn.
 Chicago Bridge & Iron Works, Chicago, Ill.
 Lancaster Iron Wks., Lancaster, Pa.
 Pacific Tank & Pipe Co., San Francisco, Cal.
 Petroleum Iron Works Co., Sharon, Pa.
 Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
 United Iron Works, Inc., Kansas City, Mo.
 Walsh & Weldner Boiler Co., Chattanooga, Tenn.

STEAM SHOVELS. (See Shovels, Steam)

STEAM TURBINES. (See Turbines.)

STEEL PLATE CONSTRUCTION

*Blaw-Knox Co., Pittsburgh, Pa.
 *Connery & Co., Philadelphia, Pa.
 *Hell Co., The, Milwaukee, Wis.
 *Heltzel Steel Form & Iron Co., Warren, O.
 *Littleford Bros., Cincinnati, O.
 Bethlehem Steel Co., Bethlehem, Pa.
 Biggs Boiler Wks., Akron, O.
 Birmingham Tank Co., Birmingham, Ala.
 Chatta. Boiler & Tank Co., Chattanooga, Tenn.
 Chicago Bridge & Iron Works, Chicago, Ill.
 Graver Corporation, E. Chicago, Ind.
 Hendrick Mfg. Co., Carbondale, Pa.
 Honhorst Co., Jos., Cincinnati, Ohio.
 McClintic-Marshall Co., Pittsburgh, Pa.
 Pennsylvania Bridge Co., Beaver Falls, Pa.
 Petroleum Iron Works Co., Sharon, Pa.
 Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
 Ritter-Conley Co., Pittsburgh, Pa.
 Scaife & Sons, Wm. B., Pittsburgh, Pa.
 Toledo Crane Co., Toledo, O.
 Union Iron Works, Hoboken, N. J.
 Walsh & Weldner Boiler Co., Chattanooga, Tenn.

STOKERS, MECHANICAL

Automatic Furnace Co., Dayton, Ohio.
 Babcock & Wilcox Co., New York.
 Combustion Engine Corp., New York.
 Detroit Stoker Co., Detroit, Mich.
 Laclede-Christy Clay Prod. Co., St. Louis, Mo.

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24 hours per day for 180 days



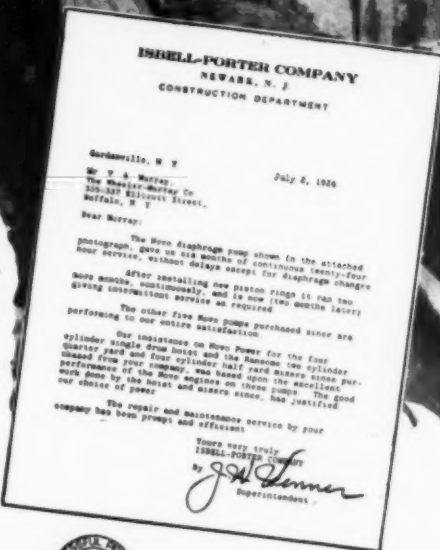
THIS Novo Pumping Outfit ran 4320 consecutive hours—six months, 24 hours per day—without delays except to renew diaphragms. (See letter at right.)

After putting in new piston rings (cost a little over a dollar) Novo pump ran two months more—24 hours a day—continuously.

Novo builds engines and outfits to stand this sort of work. Strict laboratory tests of materials, expert workmanship and seventeen long years of experience, make Novo the choice of discriminating buyers.

Novo service is worldwide. Spare parts can be obtained for any Novo Engine or Outfit, no matter how old it may be.

Sixty-five distributors throughout the United States carry the Novo line and give Novo service. Your request for information will be attended to promptly.



NOVO ENGINE CO.
Clarence E. Bement, Vice-Pres. & Gen. Mgr.
LANSING, MICHIGAN
Cable Address, "NOVO LANSING"
Distributors Throughout the World



NOVO POWER

Keeps Operations Moving



When writing to advertisers, please mention the Contractors' & Engineers' Monthly—Thank you.

Where to Purchase

45

Sanford Riley Stoker Co., Worcester, Mass.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.
STREET AND ROAD SIGNS. (See Signs, Street and Road.)

STREET CLEANERS' CARS

Durlach Can & Iron Works, Brooklyn, N. Y.
Rochester Can Co., Rochester, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.

STREET FLUSHERS AND SPRINKLERS

*Austin-Western Road Machy. Co., Chicago, Ill.
*General Motors Truck Co., Pontiac, Mich.
*Heli Co., The, Milwaukee, Wis.
*Kinney Mfg. Co., Boston, Mass.
*Mack Trucks, Inc., New York.
Autocar Co., Ardmore, Pa.
Etnyre & Co., E. D., Oregon, Ill.
Hvass & Co., Chas., New York.
Federal Motor Truck Co., Detroit, Mich.
Municipal Supply Co., South Bend, Ind.
Pierce-Arrow Motor Car Co., Buffalo, N. Y.
White Co., Cleveland, O.

STREET LAMP POSTS

American Concrete Prod. Co., Chicago, Ill.
Chicago Concrete Post Co., Chicago, Ill.
Clow & Sons, J. B., Chicago, Ill.
Drake Mfg. Co., Friendship, N. Y.
Electric Railway Equipment Co., Cincinnati, O.
King Mfg. Co., Chicago, Ill.
Mott Iron Wks., J. L., New York.
Union Metal Mfg. Co., Canton, O.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

STREET SIGNS (See Signs, Street)

STREET SWEEPERS

*Austin-Western Road Machy. Co., Chicago, Ill.
*Good Roads Mach. Co., Kennett Square, Pa.
*Kinney Mfg. Co., Boston, Mass.
*Universal Road Machinery Co., Kingston, N. Y.
Butler Mfg. Co., Cleveland, O.
Elgin Sales Corp'n., New York.
Foamite-Childs Corp., Utica, N. Y.

STREET SWEEPING BROOMS

*Littleford Bros., Cincinnati, O.
Holcomb Mfg. Co., J. I., Indianapolis, Ind.
Ind. Brush & Broom Mfg. Co., Indianapolis, Ind.
Kendallville Broom & Brush Co., Kendallville, Ind.
Lang Broom Co., Pittsburgh, Pa.
Lay Co., Jos., Ridgeville, Ind.
Milwaukee Brush Mfg. Co., Milwaukee, Wis.
Osborn Mfg. Co., Cleveland, Ohio.

STREET SWEEPING BROOMS REFILLED

Kendallville Broom & Brush Co., Kendallville, Ind.
Lang Broom Co., Pittsburgh, Pa.
Osborn Mfg. Co., Cleveland, Ohio.

STRUCTURAL STEEL AND IRON. (See Bridges)

STUMP PULLERS

*Clyde Iron Wks. Sales Co., Duluth, Minn.
*La Plant-Choate Mfg. Co., Cedar Rapids, Ia.
Bennett & Co., H. L., Westerville, O.
Thomas Elevator Co., Chicago, Ill.

SUBGRADING MACHINES

*The Hug Co., Highland, Ill.
*Lakewood Engineering Co., Cleveland, Ohio
*Shaw-Enechs Tractor Co., Minneapolis, Minn.

SUPERHEATERS

Babcock & Wilcox Co., New York.
Power Specialty Co., New York.
Superheater Co., New York.

SURVEYORS' INSTRUMENTS. (See Instruments.)

SWITCHBOARDS

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Wagner Elec. Mfg. Co., St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

TABLES AND BOARDS, DRAWING. (See Drawing Materials.)

TAMPING MACHINES

*Harnischfeger Corp., Milwaukee, Wis.
Ingersoll-Rand Co., New York.

TANKS, AIR COMPRESSOR

*Connery & Co., Inc., Philadelphia, Pa.
*Curtis Pneumatic Machy. Co., St. Louis, Mo.
*Heli Co., Milwaukee, Wis.

*Littleford Bros., Cincinnati, O.
Abendroth & Root Mfg. Co., New York.
Biggs Boiler Wks., Akron, O.
Birmingham Tank Co., Birmingham, Ala.
Chicago Bridge & Iron Works, Chicago, Ill.
Chicago Pneumatic Tool Co., New York.
Graver Corporation, E. Chicago, Ind.
Indiana Air Pump Co., Indianapolis, Ind.
Ingersoll-Rand Co., New York.
Lancaster Iron Wks., Lancaster, Pa.
National Tube Co., Pittsburgh, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Seale & Sons Co., W. B., Pittsburgh, Pa.
Westinghouse Tract. Brake Co., Wilmerding, Pa.
Worthington Pump & Machy. Corp., New York.

TANKS, STEEL

*Connery & Co., Philadelphia, Pa.
*Heli Co., Milwaukee, Wis.
*Littleford Bros., Cincinnati, O.
Biggs Boiler Wks., Akron, O.
Birmingham Tank Co., Birmingham, Ala.
Bowser & Co., Inc., S. F., Fort Wayne, Ind.
Case Threshing Mach. Co., J. I., Racine, Wis.
Caldwell Co., W. E., Louisville, Ky.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago, Ill.
Columbian Steel Tank Co., Kansas City, Mo.
Dover Boiler Wks., New York.
Farrell Mfg. Co., Joliet, Ill.
Fouts Co., O. C., Middletown, O.
Graver Corporation, E. Chicago, Ind.
Hardesty Mfg. Co., R., Denver, Col.
Hendrick Mfg. Co., Carbondale, Pa.
Honhorst Co., Jos., Cincinnati, Ohio.
Lancaster Iron Works, Lancaster, Pa.
Pacific Tank & Pipe Co., San Francisco, Cal.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Ritter-Conley Co., Pittsburgh, Pa.
Seale & Sons, Wm. B., Oakmont, Pa.
United Iron Works, Inc., Kansas City, Mo.
Walsh & Weldner Boiler Co., Chattanooga, Tenn.
Wayne Tank & Pump Co., Ft. Wayne, Ind.

TANKS, WOOD

Caldwell Co., W. E., Louisville, Ky.
Davis & Son, G. M., Palatka, Fla.
Eagle Tank Co., Chicago, Ill.
Hauser-Stander Tank Co., Cincinnati, O.
Kalamazoo Tank & Silo Co., Kalamazoo, Mich.
National Tank & Pipe Co., Portland, Ore.
Pacific Tank & Pipe Co., San Francisco, Cal.
Redwood Manufacturers Co., San Francisco, Calif.
Stearns Lumber Co., A. T., Boston, Mass.
U. S. Wind Engine & Pump Co., Batavia, Ill.
Wendagel & Co., Chicago, Ill.

TANK WAGONS

*Acme Road Mach. Co., Frankfort, N. Y.
*Heli Co., Milwaukee, Wis.
*Mack Trucks, Inc., New York.
Birmingham Tank Co., Birmingham, Ala.
Butler Mfg. Co., Minneapolis, Minn.
Case Threshing Mach. Co., J. I., Racine, Wis.

TAPES, STEEL AND METALLIC

Dietsgen Co., Eugene, New York.
Keuffel & Esser Co., Hoboken, N. J.
Lufkin Rule Co., Saginaw, Mich.
Starrett, L. S., Athol, Mass.

TAPPING MACHINES

Hays Mfg. Co., Erie, Pa.
Mueller Co., Decatur, Ill.
Smith Mfg. Co., A. P., E. Orange, N. J.

TAR

*Barrett Co., New York.
American Tar Products Co., Chicago, Ill.

TAR KETTLES. (See Kettles)

THAWING OUTFITS

*Aeroli Burner Co., Union Hill, N. J.
Hauck Mfg. Co., Brooklyn, N. Y.

TIES, STEEL

*Koppel Ind. Car & Equip. Co., Koppel, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Sweet's Steel Co., Williamsport, Pa.

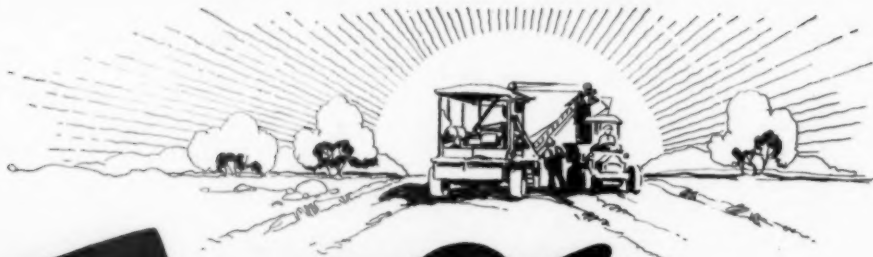
TIMBER CLAMPS

Pyle-Rogers Corp., New York.

TIRES, RUBBER. (For Motor Trucks.)

Firestone Tire & Rubber Co., Akron, O.
Flak Tire Co., Chicopee Falls, Mass.
Goodrich Rubber Co., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.

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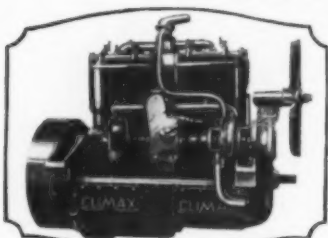
First

on the Job

in the morning

and the last to quit

at night



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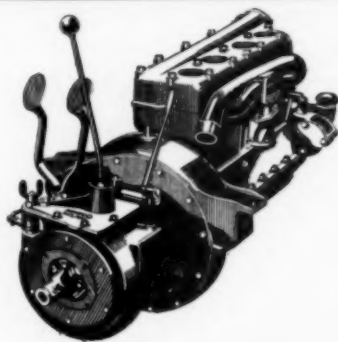
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Type "W" Universal Grab



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Terrific "Bite", Light Weight, Variable Rope Reeving and Adjustable Weights adapt this Bucket to **both** Fast Rehandling and Heavy Excavating. If **one two-purpose** Bucket instead of **two one-purpose** Buckets sounds like an interesting saving in equipment get in touch with our nearest office.

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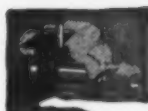


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The Lakewood 207-S

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—more compact one
bag mixer and it's
money in your
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*Write for
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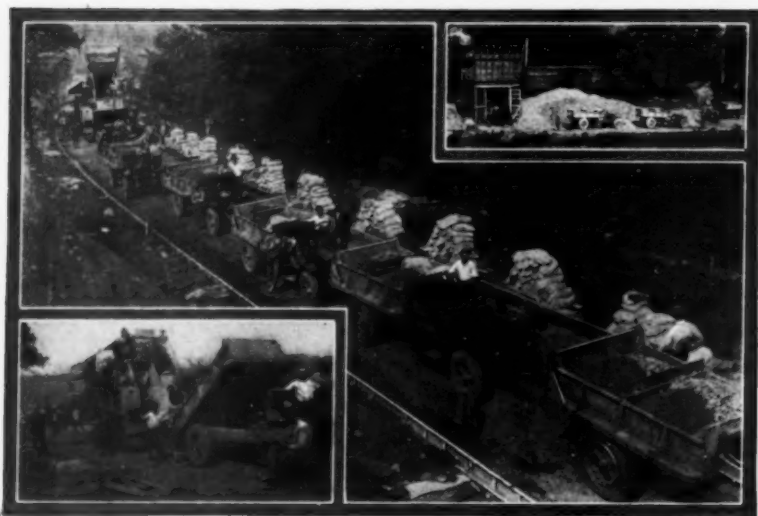
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Yes! Heil Units Stood up Well

READ Harry Siegler's letter for yourself. He is the contractor at Lancaster, Pa., who operates these Heil dumps. Siegler says: "Our contractors last year gave all the equipment a severe test, and the Heil Units stood up very well. No trouble at all was encountered. This helped wonderfully because we were far from a service station.

"The hoists raised quickly and gave a high dumping angle. You may be sure we recommend them especially for heavy work like our road contracts. Fourteen of this White fleet are now doing state road work at Madison, Florida."

Send Today for Catalog 140. Heil Bodies and Hoists made for every truck. Ask about the complete Heil Ford dump line—Bulletin 144.

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One of our Twenty-five Distributors is near You!

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April

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Selling Mixed Concrete

By Major Charles H. Miller

Vice-President, Southern Material and Construction Company, Little Rock, Ark.

THERE is no reason why a contracting organization should not mix and retail wet concrete.

Reports show that there are six central mixing concrete plants operated solely as commercial propositions, three being in the state of Illinois, one in Oklahoma City, and one in Philadelphia. There are, however, quite a number of such plants being operated by contractors on road work. The first-known central mixing plant to be erected in this country for commercial purposes is located at Kankakee, Ill., and is owned and operated by the Shidler Construction Material Company. With the outfit in use at this plant, the dealer is in a position to give the purchasing customer any mix that he may desire. The method of proportioning the cement, stone, sand and water is such that it is just as convenient to change the mix with each turn of the mixer as to run continuously on given specifications.

Advantages of Pre-mixed Concrete

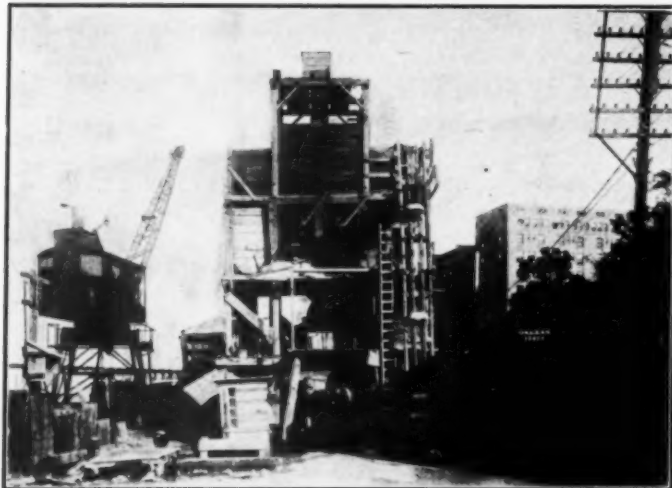
There is a decided advantage to the builder in the use of pre-mixed concrete. The builder appreciates the fact that there are no construction materials scattered around the job either during or immediately following the work. A contractor can go ahead and get his above-grade material in place while the forms are being filled. There are no piles of sand, stone or sacked cement to interfere. When the concrete is placed, that part of the job is finished and there is not a remaining sign of any material or dust in the neighborhood of the job.

Tests carried out by Professor Abrams of the Structural Materials Research Laboratories, though far from being complete, indicate that there is no appreciable loss in the strength of concrete that has stood for a period of three or four hours.

CENTRAL MIXING
PLANT OF THE
SOUTHERN MATERIAL
AND CONSTRUCTION
COMPANY, LITTLE
ROCK, ARK.

View shows the south
side of the plant, with
the Arkansas River in
the background





VIEW OF FRONT OF
PLANT, SHOWING
TRUCK RECEIVING
LOAD OF MIXED
CONCRETE

The equipment of this plant includes a Dravo crane, a Blaw-Knox clam-shell bucket and Batcher-Boxes, Stephens-Adamson elevators, a T. L. Smith mixer, and Graham trucks

"There is apparently no objection to a central mixing from the standpoint of the effect upon the concrete," states Professor Adams. He says further, "It will be found, as a matter of practical handling, that considerable attention will have to be given to the consistency of the concrete in order to prevent separation of water on the one hand, and the concrete from becoming too compacted on the other."

There are many jobs in every community that contractors would develop were it not for the fact that they are too small in size to warrant the removal of the mixer. In the use of pre-mixed concrete this is not necessary and, where a central mixing plant is in operation, the contractor can conveniently accept work of this nature. At other times a contractor's mixer may be busy on the job when he desires to start with a second crew on another. The use of pre-mixed concrete solves the problem.

Results of Eight Months' Operation at Little Rock Plant

We have some reasonably accurate figures on labor costs covering eight months' operation of our plant with an output of slightly over 15,000 cubic yards of concrete in that time. The plant consists of a mixer having a capacity of one cubic yard. This mixer is set upon an elevated platform under which trucks can be backed to receive the wet concrete. Storage bins are located a sufficient distance above the mixer to have Blaw-Knox Batcher-Boxes between the bins and the mixer. The concrete plant is operated in conjunction with the sand-distributing plant. One clam-shell crane handles the material for both operations, the laborers being transferred at times from one plant to the other and vice-versa, hence it is not an easy matter to secure absolutely accurate labor costs.

The locomotive crane handles the sand from barges to the elevator which takes the sand into the storage bins of the mixer. This crane also handles crushed rock and gravel from railroad cars to the same elevator. A cement storage house is built underneath the material bin. There is a bag elevator to raise the cement up to a loading platform. Much of the cement is handled directly from the

car to this elevator. The labor cost under the foregoing arrangements is reduced to a very low figure.

With common labor varying from 25 cents to 30 cents per hour, and skilled labor between 50 and 60 cents per hour, the average labor cost, covering the handling of the material, cleaning the mixer and operating it, or everything connected with the movement of raw materials after their delivery in cars or bags at the yard to delivering the mixed concrete into the trucks or other transportation, is $37\frac{1}{2}$ cents per cubic yard for the eight months' period and for an output of 15,280 cubic yards. Possibly 75 per cent of this material was hauled within a radius of two miles, a small portion as much as 8 miles. The average hauling cost was 65 cents per cubic yard, figuring trucks at \$2 per hour. Interest, depreciation, power, fuel and overhead will vary under different conditions and hence are not given to cover this operation.

The selling prices, of course, will vary with the cost of raw material in different localities. We deliver f.o.b. our plant 1:3:6 concrete at \$7 per cubic yard, 1:2½:5 mix at \$7.50, 1:2:4 mix at \$8 and 1:2:3 mix at \$8.25. A plant in California delivers at \$7, \$8, and \$8.50 for the first three classes, respectively, and gives no price on 1:2:3 mix. A Texas plant delivers f.o.b. trucks at \$6.10, \$6.60, \$7.10, and \$7.60 respectively. This plant uses pit run gravel which they obtain at \$1.55 per cubic yard f.o.b. their plant.

The following quotation from a letter received from the Texas plant may be of interest:

"We have sold concrete for nearly every possible purpose. The most desirable customers are naturally the large users. With us the largest users have been smaller paving companies putting on paving in suburban additions and sewer contractors. We have also sold a great deal of concrete to general cement contractors to build sidewalks, foundations, floors, etc. The building contractors have bought concrete for foundations, floors, etc. Some of this concrete has been used in places where it is handled in elevators and, in many cases where wetter concrete was desired, additional water was used on the job."

Contracting Problems

The Bonding Evil and the Force Account Evil

By W. M. Holland

Executive Secretary, Indiana Association of Highway and Municipal Contractors

WITH the advent of large road-building programs in this country, there came gradually and quite naturally a corresponding increase in public lettings, and an equal, if not proportionately greater, increase in the number of contractors desirous of doing public contract work. Consequently, the contractor is to-day engaged in a highly competitive business—competitive without the slightest degree of regulation. The bidder's field is a melting-pot. The experienced, the responsible, the well-equipped contractor is competing with the inexperienced, the irresponsible and the ill-equipped contractor without any recourse whatever. Unfortunately, public officials in general seldom have the privilege, without statutory restraint, of selecting a contractor from among competitive bidders, even though previous defaults on the part of irresponsible contractors, and delays experienced by public officials through such defaults, create a decided preference for a contractor of skill, integrity and responsibility. "The lowest responsible bidder" is the statutory restraint; and although some of our courts have liberally construed this phrase, the prevailing idea among officials, taxpayers and others is that the lowest responsible bidder is the one who submits the lowest bid and can provide a bond. "And can provide a bond" brings us to a consideration of the surety companies and their attitude toward this most important problem.

At the Fifth Annual Meeting of the Associated General Contractors of America in Chicago, January 24, 1924, the relation of surety companies to the construction industry was discussed at length, and the following resolution adopted:

Whereas, bond agents are writing bonds for contractors who are obviously incapable of performing their contracts, or who have obviously demonstrated that they cannot be relied upon to carry out their obligations in good faith; and

Whereas, the bonding of these irresponsible contractors gives them an unwarranted credit rating and, in the eyes of the public, stamps them as responsible bidders; and

Whereas, once this false stamp of responsibility is given by the bonding company to an irresponsible bidder, the engineer or architect is often obliged by a misguided public opinion to award him the contract; and

Whereas, the ease with which the surety bond may be obtained by almost any agency designating itself as a general contractor, enables innumerable persons to embark upon extensive construction projects which they cannot carry through to successful completion; and

Whereas, numerous defaults of these irresponsible companies who can obtain surety bond bring public censure upon the engineer, dissipate engineering funds, produce an inferior quality of workmanship and keep public construction in a demoralized condition; and

Whereas, these numerous defaults have greatly increased the rate of bond premiums, thereby adding to the cost of construction paid by the public; and

Whereas, operations of these injudiciously bonded bidders react injuriously upon those contractors who faithfully perform their obligations, create suspicion and distrust of all contractors and retard the development of companies that are willing and able to render satisfactory construction service; and

Whereas, the bonding of bidders unqualified by either experience, personal integrity, or financial soundness, to assume their contracts is preventing the development of constructive service, and the adoption of ethical prac-

tices which are essential to the establishment of construction as an orderly industry; therefore, be it

Resolved, that the Associated General Contractors join with the American Association of Highway Officials and representatives of the surety companies for a complete and impartial analysis of the bonding situation, seeking to find a proper solution for the issues confronting both the bonding companies and contractors.

Subsequent to the adoption of this resolution and during the year of 1924 several joint conferences were held under the auspices of the Associated General Contractors of America with the Surety Association of America, American Highway Officials Association and others. The sole and only purpose of these conferences was to find a solution for the present evils in the writing of contract bonds and, in spite of the fact that the evils of present practices were openly aired and frankly admitted, the solution has not yet been established. At one of these joint conferences in the latter part of 1924, a rather significant committee report was made; especially significant when we consider that the committee was representative of the industry. Its Chairman was President of one of the leading surety companies, and its membership was made up of the Vice-President and the General Manager of the Associated General Contractors of America, and the Chief Engineer of the Pennsylvania State Highway Department. The report in part follows:

"At the outset, this Committee desires to emphasize the fact that in a real and vital sense the interests of the contractors, the surety companies, and the owners who are having work done are identical. When a surety company writes a bond for a contractor, the surety company and the contractor become in effect partners. If there is a default, the owner suffers delay and other consequential losses not covered by the bond. The contractors, the surety companies, and the owners are therefore interested in the establishment of conditions under which defaults are least likely to occur. A default means loss for all three parties concerned.

"This Committee desires further to emphasize the fact that at present conditions are not satisfactory. Practically any contractor, whatever his financial standing, whatever his experience or lack of experience, whatever his equipment, sufficient or insufficient, whatever the relation of his liquid assets to the amount of work he has on hand, whatever the extent to which he has become over-extended, can obtain a bond. Some surety company will execute a bond for him, and he goes from one company to another till he gets what he wants. The irresponsible contractor can usually find some company to go surety for him. This is the result of competition."

It was said not long ago by a prominent surety official that there are to-day \$15,000,000 worth of contracts—highway contracts—in default in five states. A condition of this kind has a demoralizing effect on the industry, to say the least, and benefits to the public, however great, can be only transitory, whether the condition obtains here or elsewhere, since the condition itself is decidedly unsound.

At a recent meeting of the National Research Council in Washington, D. C., Frank Page, Chairman of the North Carolina State Highway Commission, reviewed the conditions to which he attributed North Carolina defaults (and there were many). In conclusion he said:

"All losses by defaulted and unfinished contracts, whether made good by bond or not, are eventually paid

by the state in its continued highway program. These losses are reflected in the higher prices of responsible contractors. It is therefore necessary for the highway officials to reduce their losses. I am therefore contemplating a plan of careful investigation of all bidders by our own department before the contracts are awarded, and the cessation of relying on surety bonds to protect us after the contract has been awarded."

The time must come when a bonding company knows and can prove that its bond is a guarantee of the skill, integrity and responsibility of the assured, and the public will learn then that a bond accomplishes its object without quibble and subterfuge, which it does not do under present-day practices.

The Force Account Evil

The evil of day labor or force account work is apparent to those who have been closely identified with public contract work; and while Indiana has been comparatively free of such evil, it has been prevalent in many other states, and invariably has a tendency to demoralize the construction industry. I shall again call upon the Associated General Contractors of America to show the attitude of that organization toward day labor, as embodied in a resolution adopted at their Fifth Annual Meeting:

Whereas, there is manifest throughout the country a tendency among public officials to do public construction by the day labor method; and

Whereas, this method of expending public funds is generally recognized as being economically unsound as a general practice, in that it provides no foundation of responsibility and offers no assurance that such work will be of proper quality and performed for the amount of money voted or appropriated therefor; and

Whereas, our construction industry is full of notorious instances of the excessive cost of this construction method, and of its encouragement to inefficiency, incompetence and sinister political influence, and of a strong tendency towards socialism; and

Whereas, the constructors are especially fitted to interpret to the public this menace, and also lay upon us the responsibility of so doing; now, therefore, be it

Resolved, that the Associated General Contractors urges its membership throughout the country to accept as a major duty a campaign of publicity to show the results of the day labor method of doing public construction and to enter upon a vigorous and persistent effort to secure legislation which will require public bodies to do public construction by the sound method of firm contracts guaranteeing completion at a fixed price.

This resolution is self-explanatory and states in no indefinite terms the attitude of the construction industry toward day labor or force account work. I feel constrained, however, to state that contractors as such have no right to demand that the work be done by contract rather than by day labor. The contractor's major argument, and it is a sound one, is that in the great majority of cases he can save money for the public. This view-point is well stated in the following editorial which appeared in the *Engineering News-Record*, issue of January 1, 1925:

"Contractors have no inalienable right to the construction work of the world. It has seemed often in the fractious discussions of day-labor construction which are currently being printed as if this truth were being forgotten—as if it were assumed that because the contractor is in the construction business he has sublime right to such construction as is being done. On sober thought no contractor believes this. If any contractor does believe it, he is wrong, because it is not so. If he talked as if he believed it, he is foolish. The building public doesn't believe it and won't believe it. It believes that the contractor has a right only to that work which he can do as well as any other agency at less trouble and cost to the employer. And why should contractors want any greater consideration than this? They can save the owner from a multitude of worries and uncertainties inseparable from day-labor operations. They can do the work as well, and in the vast majority of instances they can do it at less cost. There is much accumulated evidence in proof of all these facts, and yet they have not been assembled anew in perhaps ten years. This should be done. A well-presented brief is badly needed by contractors, who have every so often to battle the hydra of force account construction of public works."

ACKNOWLEDGMENT.—From a paper read at the Eleventh Annual Road School, Purdue University, Lafayette, Ind.

Widening Curves with a Mechanical Road Finisher

Interesting Information for Road Contractors

SOMETIMES a contractor wants to know how a mechanical road finisher is used for widened curves. The accompanying illustration tells the story admirably. A false form is set around the curve for the width of the machine, and this width is spread, tamped and surfaced mechanically.



PICTURE SHOWING OPERATION OF FINISHER ON WIDENED CURVE

The widened portion of the curve is finished by hand. Concrete for this widened portion is, of course, placed as the machine moves ahead, but the finishing is postponed until after the machine has finished its work. The false form is generally made of wood, although in some instances light steel channels set length-down on pins or stakes have been employed. The form, of course, is pulled after the machine has completed its work. This method of using a mechanical road finisher on widened curves has practically become standard, and this information is published for the benefit of those who do not happen to have run into this type of work before. The information was furnished through the courtesy of T. W. Dieckman, Paving Department, the Lakewood Engineering Company, Cleveland, Ohio.



Legal Points for Contractors

These brief abstracts of court decisions in the contracting fields may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt, consult your own lawyer

Edited by A. L. H. Street, Attorney-at-Law

Lowest Bidder's Legal Right to Award

The mere fact that a municipal contractor has had frequent disputes with the municipality, under previous contracts, does not justify disregarding his bid for work, holds the New Jersey Supreme Court in the case of *Peluso vs. Commissioners of City of Hoboken*, 126 Atlantic Reporter, 623. The decision was handed down in a case involving proper interpretation of a statute requiring awards to "the lowest responsible bidder." Referring to a finding made by defendants that plaintiff was not a "responsible bidder, notwithstanding he is the lowest bidder," the Court observed:

"This finding of the Commissioners will not be disturbed by a reviewing court unless it appears that the action was taken in bad faith, or the proofs were of such a character as to satisfy reasonable men of the bidder's responsibility. . . . 'Responsible' means ability to meet obligations. . . .

"The testimony demonstrates the fact that the bidder, Peter A. Peluso, has the necessary equipment and financial responsibility to perform the contract. . . . Giving to the testimony full credit for all that is claimed it proves, it shows the bidder . . . had a previous contract with the city. . . . During that time, there were frequent disputes in reference to the performance of that contract, . . . many of which involved controverted questions of fact, if not all. These matters should be and can be taken care of under a contract properly safeguarding the public interest, with a contractor who is financially responsible. This lack of ability to work in harmony, or to enforce the terms of a previous contract by the city officials, is now urged as a factor and a controlling factor in determining the bidder's responsibility. . . . Some cases, however, from other jurisdictions are cited in apparent support of this view. . . .

"The test, however, must be made under the New Jersey statute. As stated, the bidder's financial responsibility and the sufficiency of his equipment for the performance of the contract are not controverted."

Suspension of Contract Work—Damages Against Defaulting Contractor

In a case involving breach of a building contract, it appeared that there was an independent contract for erection of structural steel. The general contractor had agreed to complete his work on or before a specified date. Under these circumstances, the Appellate Division of the New York Supreme Court said (*Kinney vs. Massachusetts Bonding & Insurance Company*, 206 New York Supplement, 163):

"If, in the course of the work, the steel contractors had so occupied the lot with men, materials, and machinery as to render economical and advantageous work by the general contractor im-

possible, it would doubtless have been the privilege of the latter temporarily to suspend work. Its obligation was to complete upon a certain date. A suspension which did not imperil that result would not be unreasonable, and would afford to plaintiffs no just ground of complaint."

The same opinion approves items of damage allowed on a contractor's bond where he wrongfully failed to complete work. The principal item allowed the owner was the difference between the lump sum at which another contractor agreed to complete the job and the amount remaining unpaid the defaulting contractor when he abandoned the work. Other items awarded the owner, as having been entailed through the first contractor's default, included sums paid to architects for superintending the work performed by the substitute contractor, and paid for legal services in connection with the default. Other items included the cost of bonds securing faithful performance by the substitute contractor and to discharge liens filed on claims against the first contractor.

Computing Contractor's Compensation Under Cost Plus Contract

Time actually devoted in performing contract work on a cost plus basis is not necessarily conclusive as to the contractor's right to recover. The owner is entitled to have determined a question as to whether excessive time was devoted. This important statement of a legal principle is supported by the recent decision of the Vermont Supreme Court in the case of *Rutland Sash & Door Co., Inc., vs. Gleason*, 120 Atlantic Reporter, 577. The contract involved in that case was one for the manufacture of millwork on the basis of the cost of lumber, plus 10 per cent, plus milling at \$1.50 per hour for man and machine. But, manifestly, the same reasoning would apply to cost plus construction contracts. The Court remarked:

"The evidence respecting the time required for a workman of average skill to perform the work in question was objected to on the ground that the cost under the contract was the time actually expended on the work and not how long it ought to take to do the work. But the objection falls when full effect is given to the contract. The agreement to pay for the work by the hour implies an understanding that only the time reasonably necessary to perform the work shall be charged for. Not only must the plaintiff show that the time was actually spent, but, if questioned, that it was properly spent; in other words, that it was reasonably necessary. It is not to be supposed that the parties to the contract intended anything short of this."

It was also decided that evidence of a preceding offer by the contractor to do the work for a lump sum was admissible as having a tendency to show what was a reasonable allowance for labor.

Responsibility of Public Corporations to Subcontractors on Public Buildings

Referring to a Connecticut statute governing contracts for the construction of buildings for the state or any of its political subdivisions, the Supreme Judicial Court of Massachusetts said in the recent case of Ninth School District of Manchester vs. Rogers, 145 Northeastern Reporter, 278:

"Contractors, subcontractors and every person, firm or corporation furnishing or receiving materials and labor used or to be used in the construction of any public building in the state of Connecticut are chargeable with knowledge of all general laws of that state, and consequently know that a subcontractor, as such, has no legal enforceable claim against the plaintiff for materials and labor furnished the contractor or used in the construction of a public building unless the officers of the district received of the contractor, 'a bond with sufficient surety . . . conditional for the faithful execution of the contract according to its provisions and for the payment of all materials and labor used or employed in the execution of such contract.' In the absence of a bond taken by the district the plaintiff was under no legal or equitable obligation to pay the subcontractors for materials and labor furnished or used in the construction of its public building. 'The duty of taking the bond provided for in the statute quoted is not imposed on the corporation. It is not taken for the benefit of the corporation or its inhabitants, but is for the benefit of any person who shall perform labor or furnish material to the person or persons who contract with a public officer to construct any public improvements, whether such persons be residents of the city or elsewhere. The duty is a public one, in the interest of the public, imposed by statute on public officers, and with which the corporation, in its private capacity, has no concern.' . . .

"The statute above quoted is mandatory in the provision that 'any officer . . . contracting in behalf of the state or any subdivision thereof for the construction of any public building shall require from each contractor, as a condition precedent to the execution of a contract for any such construction, a bond with sufficient surety.' . . . The requirement of a bond is in the terms of the statute quoted a 'condition precedent to the execution of a contract.' The authority of the officers of the district to make the contract was conditional upon a receipt of the bond. The absence of a bond was the absence of a fact or condition without the presence of which no contract could be legally made by officers acting for the state or any subdivision thereof."

The court cites similar decisions reached by the highest courts of Kansas, Minnesota, Tennessee and Arkansas under similar statutes in force in those states.

Liability for Supplies Furnished to Subcontractor

A highway contractor undertook to pave a road for the state of Minnesota, giving bond to pay for materials used, etc. The haulage of certain materials was sublet to a motor transportation company. The latter company was then indebted to plaintiff for \$3,400 on account of gasoline furnished it previously, and for use wholly discon-

nected with the particular work. In the performance of its contract with the highway contractor, the haulage contractor became indebted to plaintiff in a further sum of about \$3,400 for oils, etc. The contractor paid the haulage contractor \$41,801.77, in full, and the latter paid plaintiff \$5,250 on account. Plaintiff knew that the money so received came from the highway contractor, and, according to understanding with the latter, the payment was applied, first to the haulage contractor's old indebtedness, and then to the account for oils, etc., furnished for use in performing the particular contract. This left a balance of about \$1,600 due plaintiff on the last stated account. Suit was successfully brought against the highway contractor and the surety on its bond to recover the amount. The official syllabus of the Minnesota Supreme Court reads, in part:

"Held.—(1) That the money so unconditionally paid to the subcontractor became its money and it could use it as its own, and the surety cannot direct application of payments, and that the plaintiff may recover the balance of its account from the original contractor and the surety." (Standard Oil Company vs. McGree, Moos & Company.)

Validity of Ordinances Fixing Minimum Wages on Public Work

While a city may provide by ordinance that a certain minimum wage scale shall be paid for labor employed in public construction, or repair work, the ordinance cannot be applied to work not contracted for by the city council, but by an independent board of school directors. In reaching this conclusion under an ordinance of defendant city, the Supreme Court of Wisconsin said in the recent case of H. Schmitt & Son, Inc., vs. City of Milwaukee, 200 Northwestern Reporter, 678:

"A city, as to contracts for public buildings which the city erects in its proprietary capacity, may, the same as a private individual or corporation, declare, within reasonable limitations at least, the terms and conditions upon which and under which work being done for it shall be performed. Such ordinances, therefore, must be considered from that view-point and with that foundation rather than as ordinances passed by the same common council in the exercise of the so-called police power for the general welfare.

"In this case the power to make this particular contract is not in the common council but in the board of school directors. The latter, not the former, have had delegated to them the function and power of making this contract, and in the legitimate exercise of such power they cannot be interfered with or controlled by regulations or conditions which may be prescribed by the common council for buildings over which they in turn have exclusive power and control. The lines between the two are clearly marked and defined, and within their respective provinces neither can be controlled by the other. To hold otherwise and to sustain respondent's contention would logically and necessarily permit the common council to dictate to the school board as to any other and all conditions of contracts for school buildings, and would thereby permit the common council to do indirectly the very thing that the Legislature has expressly directed shall be done by the school board."

The Benefit of Quantity Surveys

A Presentation of Developed Thought on This Subject from the Contractors' Standpoint

By Louis W. Hickey

Hickey & Montgomery, Dallas, Texas

THE quantity survey, as applied to building construction, has many ramifications which appear only after close study; and can, if properly applied, have a highly salutary effect upon a constructor's operations.

Curiously enough, the survey, considered strictly as such and no more than a take-off of quantities and the contingent arithmetic calculation and extension, is not essentially important. Few well-managed construction organizations should need the assistance of a survey bureau to insure the accuracy of their estimates and bids: the system of checking and cross-checking within each estimating department should certainly be such as to make errors practically impossible.

Quantity Survey Can Be Justified

As a method of checking only, however, the use of a bureau can be justified on the ground of eliminating some duplication that would exist without the bureau. That is, a single responsible check upon ten individual estimates must in the end be cheaper than ten separate checks upon the same estimates—provided, of course, that such a bureau check is actually, if not financially, responsible. This is true only of a survey bureau operated by and within the chapter: an external, privately owned, commercial bureau should of course be financially responsible to its clients against errors.

Aside from the elemental considerations of catching errors and eliminating some duplication, there are other functions—much more important functions—that a well-managed survey bureau can perform.

It can provide a practically impartial channel of intercourse between the architect or engineer and a group of bidders. Conflicts in specifications, errors or omissions on plans, obscurities in the architect's interpretations or intent, and other such obstacles to uniformity in the bidding basis, can be cleared up and presented to all the bidders.

It can give tremendous support to the principle of uniform, standardized estimate sheets, so that all bidders in the same community are encouraged to make up their bids in about the same form. Such a practice will teach bidders that certain job operating costs, which are often negligently or wilfully omitted from a bidding estimate, have to be shouldered on the job, and might just as well be included in all the bids submitted for a particular project as in only a few of such bids. If a quantity survey bureau can insure progress in this direction, as most constructors believe it can, a bureau might well be justified on this one count alone; namely, that it is a cogent force for education within the chapter.

Again, there seems to be an honest desire among the surety companies for some agency that can and will give them dependable information on bids and bidders. The surety people in the Southwest report that they have no difficulty in getting favorable information, but that what they really need, in studying the execution of a bond, is honestly unfavorable information. It takes courage, naturally, to give unfavorable opinions; but it usually takes

courage to apply, or to partake of, all medicine. Any unhealthy situation needs some kind of disagreeable restorative action; and perhaps a survey bureau will be one of the agencies through which we can actively cooperate with the sureties, to their ultimate benefit and our own.

The Survey Can Exert Influence

There are, finally, two phases of the construction industry in which the quantity survey can exert an extremely elevating influence. The first phase is that of segregation of contracts for certain branches of work. So long as constructors as a whole will continue to figure only excavation, concrete work, masonry, and some carpentry, and to depend upon subcontractors, dealers, or mechanical constructors for figures on the rest of the work in a given operation—and let it be clearly understood that this latter work often amounts to as much as 80 per cent of the whole job—just so long will they continue to give a certain measure of support to the practice of segregating branches of work out of the general contract.

The very fact that the soundest banks, fiscal agencies, Federal departments, architects and engineers declare and operate against segregation, both in principle and practice, makes it the more incumbent upon constructors to be general constructors, not simply in name, but in fact. We, as general constructors, cannot afford to flout by practice what they hold in principle.

While it may never be wholly expedient for the constructor actually to do all the work in building, for instance, an office building, he should certainly be competent to figure all of it without excessive dependence on collateral constructors, dealers, or material houses. Indeed, he should go further, and actually do as much of the work as is expedient: not, of course, to the extent of owning railroads, mines, quarries, trust companies, and the numberless industries that underlie a given building operation; but he should go as far as expediency will permit. Now, a quantity survey bureau, while not directly a means of encouraging constructors themselves to do as much work as is feasible on a job, can assuredly be made a means of figuring all the work in a job and becoming more and more competent in, at least, the handling of all such work. Such a condition will strengthen our status as general constructors, our recognition by the public as such, and our stand against segregation.

A Notable Tendency

And, lastly, by continuously decreasing our dependence upon subcontractors for subproposals prior to the letting of a job, a well-managed, broadly scoped survey bureau should tend toward the modification and ultimate destruction of the vicious practice of shopping. The subject of shopping is a broad one; and there is much to be said on both sides of the question. It is not a whit less proper for respectable general constructors to be forced by architects or owners into competition with irresponsibles, than for the same general constructors to force responsible subcontractors into competition,

particularly after a letting, with irresponsible operators in the subbranch.

Since the subject under discussion, however, is the quantity survey, and not shopping, suffice it to make this statement: that, if the field of the quantity survey be extended to take in all branches of work, and if all this work be figured by general constructors in honest—not fictitious—competition with responsible subcontractors through an intelligent survey bureau, we can remove one of the reasons why subcontractors want segregation, we can mitigate the degree of price-gambling in the bulk of our work, and we can heal a sore which has apparently spread over most of the country.

Having assumed the leadership in lighting the way to better conditions, we must, to be recognized

as leaders, carry on.

If, then, the quantity survey is worth while, how shall it be administered? Briefly, there is practically no deviation from the opinion that the survey bureau must be operated by and within the chapter. Participation by chapter members, or by individual members in external, privately owned, commercial bureaus appears to be unanimously looked upon as dangerous and as encouraging irresponsibility. Many chapters have been operating bureaus for years, though few of them seem to have extended their field to the extent recommended above. All, however, agree that the bureau absolutely must be operated by and within the chapter.

ACKNOWLEDGMENT.—From a paper delivered at the Sixth Annual Convention of the Associated General Contractors of America, at Washington, D. C.

Excavation for Approaches to Delaware River Bridge

Large Contract Involves Moving Over 100,000 Yards of Material

THE erection of the Delaware River suspension bridge between Philadelphia, Pa., and Camden, N. J., involves some of the largest feats of engineering that have ever been attempted in suspension bridge construction. This bridge, a series of construction photographs of which appeared in the August, 1924, issue of *CONTRACTORS' & ENGINEERS' MONTHLY*, on pages 59-64, when completed will have a total length of a mile and a half, each span being 1,750 feet long with a width

was necessary to remove a wide swath of buildings in the very heart of the city, rip out the foundations and excavate for grade and solid footing. In doing this, digging of the toughest kind was encountered. Old foundations, concrete floors of cellars, heavy brick and plaster walls, had to be broken up and shoveled out. This material was further entangled by pipe work from the old gas and water mains and other general debris. The soil itself is a heavy loam, streaked with clay, and



P & H 26694-YARD SHOVEL EXCAVATING FOR THE PHILADELPHIA APPROACHES OF THE DELAWARE RIVER SUSPENSION BRIDGE

of 54 feet. The suspension cables used will be 30 inches in diameter. The total cost of the bridge is expected to approximate \$25,000,000, of which amount about \$8,000,000 is to be spent on the bridge approaches alone. The excavation for these approaches has been undertaken by Edward C. Gahagen of Philadelphia, and a considerable amount of the dirt on the Philadelphia side has already been removed.

To obtain straight approaches to the bridge, it

with rocks scattered through it. This indicates the tough character of the work.

Mr. Gahagen originally decided to use two power shovels on this job, but in actual operation found that one P & H Model 26694-yard shovel handled the whole job satisfactorily. During the first month of operation this machine moved about 12,000 cubic yards of material. The daily output averaged about 450 yards, with a record of 534 truck-loads of 2½ yards each in 10 hours.

"The Economics of Wheel Scrapers," "Evolution of Highway Construction and Maintenance Equipment," and other features are ready for coming issues.

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FOREMAN'S REPORT OF WORK AND MATERIAL.
This report is filled out by the foreman and shows how much work was done that day and any materials used.

[illegible]

DAILY DISTRIBUTION OF LABOR COSTS

This form shows the cost of each operation daily, taken from the foreman's daily distribution report, as well as showing the total costs of all operations daily.

compare his check with the distribution turned in by the foreman, to see that each employee was given the correct time worked and that proper distribution has been made.

The timekeeper totals the hours of each operation and balances the grand total of all hours worked, posts the rates, extends the daily wage of each employee, totals it, and balances it with the total of each separate operation cost. The time should then be posted in the pay-roll book, and the hours totaled, and this should check with the grand total of all hours shown on the distribution report. A balance should then be made between the total distribution cost and the total pay-roll as extended for that day. The total distribution cost is posted in the back of the pay-roll book, and each operation cost posted separately alongside under code numbers taken from a card of accounts covering each operation or construction cost.

When the pay-roll is made out by balancing hours, extending and computing rates, the total wages due will equal the total distribution for the same period if balanced daily. Pay-roll deductions

and the net amounts due employees, with a total, are then made, and the pay-roll is ready for audit by the office manager or bookkeeper, who makes out change slips and places the money in envelopes or makes out the pay checks, according to the prescribed method of paying. Each operation cost should be recorded in the Accounts Payable ledger, thus tying up the cost with the general accounting system.

On the reverse side of the foreman's daily time report is a space designated to take care of the amount of work accomplished each day, such as grade finished, concrete poured, brick laid, etc., and the unit and total cost of the operation. Also, there is a space for material received, used, and on hand. This is filled in by the foreman and checked by the timekeeper before the record is turned into the office. Thus the contractor has a daily report of all construction costs, work accomplished, material received, material used and material on hand, and can easily compute his daily profits and know his losses in time to turn the losses into profits by a different plan of execution of work before it is too late.

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PAY-ROLL FORM

This form is used to show the time for one-half month as entered by the timekeeper, balanced, extended, and checked by the paymaster

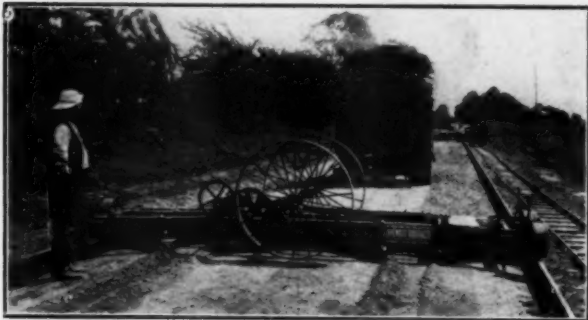
Combination Haul Plant Used in Building 15 Miles of Concrete Road

Hill & Hill Company, Elyria, Ohio, Used Trucks and Industrial Railway in Construction of Niles-Ashtabula Road

At the beginning of the 1924 construction season, Hill & Hill Company, Elyria, Ohio, had a contract with the state of Ohio for the construction of a 15-mile stretch of concrete road designated as the Niles-Ashtabula Road I.C.N. Sections, M, N, O, P, Q, and R. The road was 16 feet in width, 7 inches thick, with 2-foot edges thickened to 9 inches. The average thickness of the road was $7\frac{1}{4}$ inches, and the mix 1:1½:3.

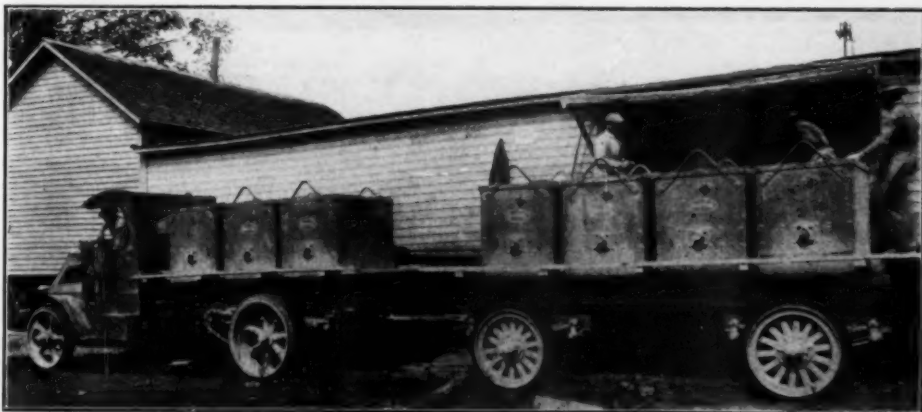
About 3 miles of the road was old macadam in very bad shape. The rest was of clay with some gravel mixed into it. The whole road after the winter season was in very bad condition and the possibilities of hauling over it at the beginning of the construction season were nil. The railroad paralleled the road about 4 miles away. After careful consideration of all types of hauling and a study of the possibility of truck haulage at the beginning of the season and the delays that were sure to come with every fall of rain if trucks were used to haul over the subgrade, the contractors decided to use a combination of trucks and narrow-gauge industrial railway.

The general plan was as follows: The proportioning yard was set up at East Orwell. From here a road led straight to the road to be constructed $4\frac{1}{2}$ miles away. The beginning of the work was $2\frac{1}{2}$ miles south of this intersecting point. These 2 miles and the 2 miles north of this point were built from narrow-gauge track. The trucks with trailers attached hauled properly proportioned



PREPARING THE SUBGRADE WITH A LAKEWOOD WOOD SUBGRADER

batches in batch-boxes to the railway. These batches were then transferred from trucks to narrow-gauge cars and hauled to the mixer. When the 2 miles north of the intersecting point was complete, a portion of the pavement was cured enough to allow the trucks to haul over it. The narrow-gauge track along this portion was moved up ahead and the transfer point also moved ahead. Thereafter, each day the track and transfer point were moved until $3\frac{1}{2}$ miles of road was built north of the intersecting point of the road under construction with the road from East Orwell. Then the proportioning yard was shifted to Rome. The road from Rome was $3\frac{1}{2}$ miles from its point of intersection with the road under construction. The 2 miles to be built from this point to the end of the piece built from East Orwell were constructed from



TRUCK AND TRAILER HAULING UNIT AND CEMENT SHED WITH ITS LOAD OF SEVEN KOPPEL BATCH-BOXES



THE TRANSFER POINT WHERE BOXES WERE SHIFTED FROM TRUCKS TO NARROW GAGE, SHOWING INGERSOLL-RAND AIR-COMPRESSOR MOUNTED ON FORD TRUCK, AND AIR-HOIST FOR BATCH-BOXES

industrial track. The 4 miles north of the point of intersection of the road from Rome with the road to be built were constructed as described above. The track and transfer point were moved each day as the pavement could be traveled on. The loading plant was then moved to Jefferson. The end of the job was $2\frac{1}{2}$ miles from this point. The $3\frac{1}{2}$ miles remaining were constructed from here as described above.

The truck hauling was subbed to a trucking contractor for so much a batch-box mile. He placed six 5-ton trucks and six 8-ton trailers on the job. The trucks carried three batch-boxes, and the trailers four. The batch-boxes contained a 6-bag batch of 1:1½:3 mix. This outfit supplied the mixers to capacity, averaging about 40 batches per hour very readily, at the average haul of 4.35 miles. On the maximum haul of 6 miles they were pushed to the limit and another truck and trailer were really needed, but inasmuch as this maximum of 6 miles lasted for only a short time, the extra outfit was not used. On the 6-mile haul, the outfit made 7 round trips per 10-hour day. Allowing 7½ minutes to load and 7½ minutes to transfer the batch-boxes, the trucks traveled at about 10 miles per hour.

The average haul on the narrow-gage track was

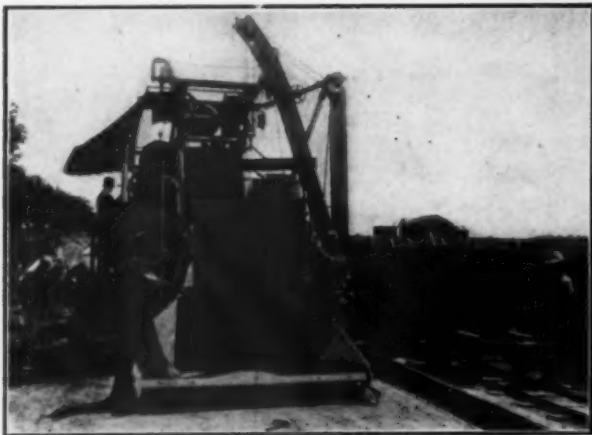
1½ miles. The maximum haul was 2 miles. The equipment was split into three trains of 7 to 9 cars each. The locomotives were left attached to the train at the mixer, shifting cars there. At the transfer point the locomotives switched to the extra train. This outfit could at all hauls easily supply the mixer to capacity. By the liberal use of sand, the locomotives were able to haul 9-car trains over 5 and 5.9 per cent grades.

The general method of operation of the combination outfit was as follows: The 7 batch-boxes on a truck and trailer were loaded at the proportioning yard. The stone and sand from an overhead bin of about 100 tons capacity, which was kept filled by a gasoline crane, was used in filling the batch-boxes. Cement was placed from freight cars or from the cement sheds. This work was contracted to one man at so much a sack, and he with four helpers took care of the work. Four men with the crane operator and a foreman handled the stone and sand. It took an average of 7½ minutes to load 7 batch-boxes. The batch-boxes were then hauled to a transfer point at the beginning of the narrow-gage track and transferred from the trucks to the industrial road cars.

The transfer equipment, designed by the contractors, consisted of an Ingersoll-Rand Type D 2-ton air hoist mounted on an 8-inch steel I-beam, supported by two A-frames on each side of the road. An air-compressor mounted on a Ford truck supplied the air for its operation. The transfer was moved on two 6 x 6 timbers placed on top of the batch-boxes on one of the trucks. It generally took an hour and a half to move.

From the transfer point, the batches were hauled over the narrow-gage track to the mixer, and transferred from the cars to the skip of the mixer by a small derrick mounted on the mixer. The weight of the descending skip furnished the necessary power.

At the transfer point four men and a foreman were used. Two locomotives comprised the motive power for the train. An average of 600 feet of track had to be



MATERIALS BEING DELIVERED TO SKIP OF MIXER

taken up and relaid each day. Six men and a foreman did this work and maintained the track. At the mixer three men were required to shift the boxes from cars to skip and back to the cars.

The contractor started this work on April 23 and operated 185 days. On 135 days the concreting was done; 15 days were lost on account of rain; 7 days were lost moving the material-proportioning yard; one day was lost on account of no materials; there were 26 Sundays and the Fourth of July when the outfit did not work. The average run for the 135

days that the mixer operated was 585 feet. The maximum run was 903 feet in 11 hours. The best run was 878 feet in 10 hours. On July 1 the contractors were 9,000 feet behind their schedule. They finished the job a week ahead of schedule. They estimated they could not have worked 50 per cent of the time with any other method of hauling, showing that under difficult hauling circumstances a combination of truck and industrial railway hauling should be given serious consideration by road contractors.

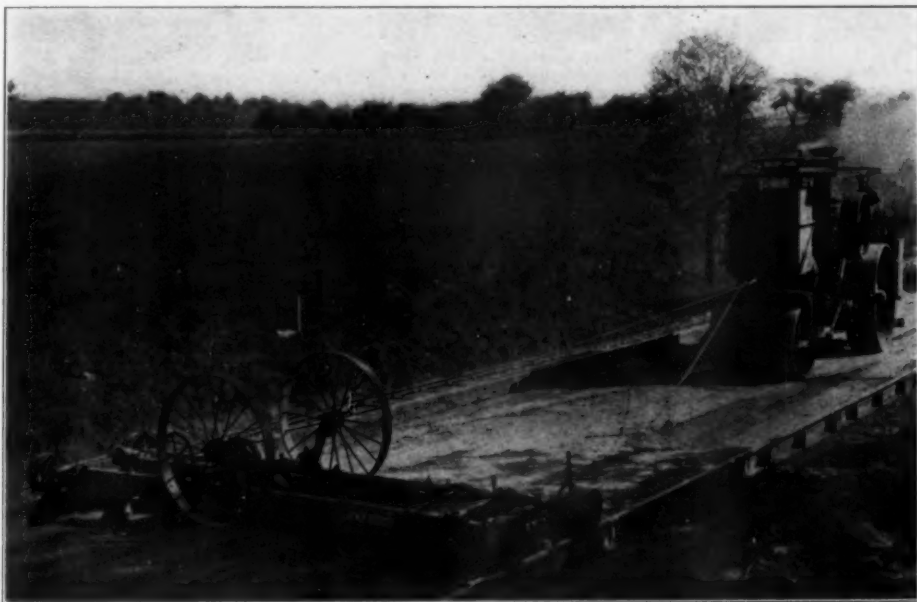
The Advantages of Mechanical Subgrading

Minimizes Labor, Produces a True Subgrade and Insures Against Waste of Concrete Due to Low Subgrades

CONTRACTORS are interested in every machine or method that will produce a saving of labor or material. Some of the advantages which are claimed for the Lakewood subgrader, made by the Lakewood Engineering Company, Cleveland, Ohio, are that it does the work with a minimum of labor, it produces a true subgrade,

places, which results in the correction of the subgrade in the minimum time. With the very fine working adjustments provided, the subgrade may be planed with great accuracy.

The third saving is the prevention of waste of concrete if the grade is low. To illustrate how quickly a subgrade which is too low eats up the



LAKWOOD SUBGRADER BEING HAULED BY HUBER STEAM ROLLER

and it insures against the waste of concrete due to low subgrade.

It is said that a few hours' use of this mechanical subgrader per day will complete the fine grading for 700 to 900 feet. A further saving is made in time and labor because the subgrader acts as a template to indicate immediately the high and low places in the subgrade. For the first time over, the blades are set from one- to two-tenths high. With this setting they cut the tops of the high spots and show immediately where low spots must be filled. The excess dirt from the high places can then be drifted without lost motion to the low

profits of the job, it is necessary only to point out that if the subgrade on an 18-foot job averages a quarter of an inch low, it requires an extra 73 cubic yards of concrete per mile, which must be paid for by the contractor himself. The subgrader eliminates this contingency.

The Lakewood subgrader is a steel or wood frame on the underside of which are sharp blades set to the required crown. This frame is carried on the side forms by accurately machined wheels. The depth of cut made by the subgrader is regulated by an eccentric or crank axle at each wheel, operated by a lever and quadrant. The purpose of this

crank axle is to raise or lower the subgrader blade with reference to the side forms. This provides the working adjustment for the depth of the cut. The wood subgrader is made for pavements from 9 to 18 feet wide, while the steel subgrader covers from 16 to 24 feet. The steel subgrader is adjustable. Each size will handle two different widths of pavement, 16 and 18 feet, 18 and 20 feet, and 22 and 24 feet. The wood subgrader is not adjustable, but its width is easily changed by installing new cross-members, which can be done in less than half a day. The blades are made of special high-carbon steel, such as is used for standard grader blades. Two sets are furnished with each machine.

These subgraders are furnished for any specified crown, flat, circular, or the special crown required by thickened-edge pavements. Adjustment for crown is provided on the angles which carry the cutting blades. These angles are slotted so that it is easy to make any crown which may be required. The blade arrangement is designed to relieve the form of side thrust by balancing the pressure when cutting is of uneven distribution. The arrangement of the blade also is such that it leaves the excess of material behind the subgrader in convenient windrows, which may be moved to the low spots or wasted outside the forms with slip-scrappers or fresnoes as desired.

The steel subgrader is provided with scarifying teeth carried on the front member, which serve to break up the subgrade. This is particularly advantageous on some soils and therefore the steel subgrader is suited for heavier work than the wood machine. A turntable pedestal is furnished on all steel subgraders and also on the 16- and 18-foot wood subgrader. When this is operated by a

hand wheel and gear arrangement, it is easy to reverse the subgrader or to allow passage of the roller or trucks. On narrow widths of road where there is not enough clearance for the roller or trucks to pass, the subgrader is turned lengthways. Wood subgraders from 9 to 16 feet in width are therefore equipped with jack-wheels on which the machine may be raised and wheeled to one side.

After the low spots have been filled and rolled, successive cuts are made with the subgrader until the grade is to exact contour. The number of cuts required depends upon the character of the soil. Two to three round trips are generally sufficient to produce the final grade, and a greater saving can be obtained by the contractor if during the subgrade operations there is available at least 500 feet of forms over which to operate.

For best results, the roller or tractor which is pulling the subgrader should be kept about 25 to 30 feet ahead of the machine. This is advantageous in allowing the blades of the subgrader to balance the thrust of the cut. The scarifying teeth on the front member of the subgrader are generally set with their points a little below the cutting blade. Additional depth for scarifying with these teeth is obtained by raising the rear of the subgrader with the eccentric axle so that it tips down at the front of the machine.

Some soils may require sprinkling and rolling before the final cut is made with the subgrader. This insures a smooth grade that will not be torn or gouged out. This sprinkling, however, is required only on a few jobs. Before the subgrader is used, the rough grade between the forms should be lightly scarified.

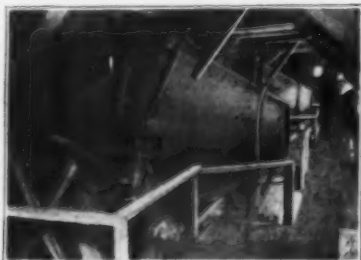
The Exchequer Dam and Power-House

Continuation of Work on Merced Irrigation District Progressing Rapidly

THE Exchequer dam and power house, now in the course of construction for the Merced Irrigation District, California, is being pushed rapidly to completion under the direction of Bent Brothers, Inc., and, barring unforeseen difficulties, should be finished well within the estimated time limit.

Some idea of the big job ahead of the contractors, however, is given by the following data: When completed, the dam will be 325 feet high, 950 feet wide at the highest point, and 221 feet wide at the base. There will be a storage capacity of 280,000 acre-feet, the spillway discharge will be 70,000 feet per second, and there will be two power units, each capable of developing 16,750 horsepower.

In all, the job will require 380,000 cubic yards of concrete, all of which is being poured by a battery of three 56-F Smith tilting mixers which produce 2-yard mixed batches.

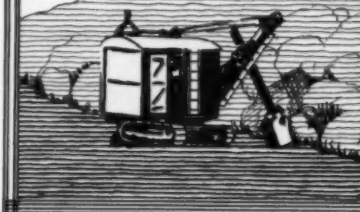


BATTERY OF THREE 2-BAG SMITH TILTING MIXERS AT EXCHEQUER DAM



EXCHEQUER DAM AND POWER PROJECT UNDER COURSE OF CONSTRUCTION IN MERCED IRRIGATION DISTRICT, CALIF.

Dig Into This Information



The catalogs and pamphlets listed below are available for free distribution. Contractors and Engineers who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up-to-date on the subject of machinery and equipment.

TRUCKS BUILT FOR ROAD CONTRACT SERVICE

The United "Constructor," a high-speed single batch unit motor truck designed and built for road contractors' work only, is described in the literature of the United Motors Products Co., Grand Rapids, Mich.

PRECISE TRANSITS

Bulletin No. 51 issued by the J. C. Ulmer Co., 113 Prospect Ave., N. W., Cleveland, Ohio, describes in full its line of field supplies including high-grade engineering and surveying instruments.

A 5-7-TON HEAVY-DUTY TRUCK

The Atterbury Motor Car Co., Buffalo, N. Y., has announced its new 5-7-ton heavy-duty seven-shift motor truck, known as the Atterbury Highway King. This truck is described in detail in the latest literature issued by this company.

A POPULAR CONVERTIBLE EXCAVATOR

The Model 16-B Bay City convertible excavator, which operates a skimmer scoop, ditcher scoop, shovel dipper or crane and which is popular with highway, sewer and general contractors, is described in Bulletin No. 21 CE, which may be secured from the Bay City Dredge Works, Bay City, Mich.

DEPENDABLE DELIVERY OF ROAD BINDER

Contractors bidding on bituminous construction will do well to find out about the dependable delivery of Tarvia products by the Barrett Co., 40 Rector St., New York City. The literature of this company describes methods of constructing different types of bituminous pavements, as well as its delivery system.

A BLUE-PRINT DRYER

A blue-print dryer having a number of interesting features and capable of drying 8 linear feet of dripping-wet blue-print per minute without wrinkles is described in literature which may be secured from the C. F. Pease Co., 858 N. Franklin St., Chicago, Ill.

BIG MIXERS FOR BIG JOBS

Information regarding the Smith 56-S tilting mixer, which is a standard unit on big construction jobs, will be found in the latest bulletin of the T. L. Smith Co., 1030 32nd St., Milwaukee, Wis.

POWER CLUTCH ON GASOLINE SHOVEL

Bulletin 81-X issued by the Harnischfeger Corp., successor to Pawling & Harnischfeger Co., 3819 National Ave., Milwaukee, Wis., contains a great deal of information regarding the new P & H shovel, which is handled more easily, lessens fatigue, and gives a greater output per day.

KNOW YOUR WIRE ROPE

The Telfax system of grade marking provided in Williamsport wire rope guards against mistakes. The story of the Telfax system, together with other important information regarding Williamsport wire rope, is found in the illustrated literature of the Williamsport Wire Rope Company, Williamsport, Pa.

A HEAVY-DUTY GASOLINE SHOVEL

The Koehring heavy-duty gasoline shovel No. 1, the crowding action of which is independent of all other functions and which is capable of handling a 34-cubic-yard dipper water measure or a 34-cubic-yard dipper heap measure, is described in the literature of the Koehring Co., Milwaukee, Wis.

A POWER-DRIVEN CONCRETE ROAD FINISHER

The Ord concrete road finisher, which saves men, concrete, money and worry, is described in full in literature of A. W. French & Co., 208-212 N. Clinton St., Chicago, Ill.

A COMPACT ONE-BAG MIXER

The Lakewood 207-S mixer is a sturdier, faster one-bag mixer built specially for contractors and is described in catalog 21-M which may be secured from the Lakewood Engineering Co., Cleveland, Ohio.

FACTS ABOUT REVOLVING SHOVELS

In Bulletin 250, the Osgood Co., Marion, Ohio, gives facts and pictures regarding its complete line of revolving shovels and combinations, as well as heavy-duty gas shovels, draglines and clam-shells and large unit railroad steam shovels.

A MONEY-SAVING CONCRETE SURFACER

The Berg concrete surfer, which removes projections and fins on concrete walls and ceilings quicker and more cheaply than other methods, is described in literature which may be secured from the Concrete Surfacing Machinery Co., Dept. F, 4669 Spring Grove Ave., Cincinnati, Ohio.

A POWER-DRIVEN DOUBLE-DIAPHRAGM PUMPING UNIT

Novo double-diaphragm pumping units, both open and closed, which will handle 30,000 gallons per hour, 24 hours a day, are described in full in the latest literature of the Novo Engine Co., Lansing, Mich.

AN EASILY ADJUSTED CLUTCH

The Twin Disc clutch, the adjustment for which is easily maintained, because of the patented lock pin feature, is described in full in the literature of the Twin Disc Clutch Co., Racine, Wis.

HEATING KETTLES THAT WORK QUICKER

Contractors have written to Littleford Bros., 500 E. Pearl St., Cincinnati, Ohio, saying that Littleford kettles on the same job, handling the same type of work as other kettles, heat much quicker and have a daily capacity considerably in excess of other types. These kettles, as well as paving tools, pouring pots, tool heaters, sand and gravel dryers, are described in full in literature which may be secured free on request.

WELL-BUILT BATCH-BOXES

Properly designed, well-built and well-reinforced industrial cars and batch-boxes made by the Koppel Industrial Car & Equipment Co., Koppel, Pa., are described, together with Koppel rails, switches, frogs, and industrial tracks, in free literature which may be secured by any contractor, without obligation.

POWER FOR CONTRACTORS' EQUIPMENT

Vertical and horizontal engines which have proved satisfactory in the service of many contractors are described in the literature of the Alamo Engine Co., Hillsdale, Mich.

STEEL FORMS FOR CONCRETE WORK

Thousands of concrete jobs, large and small, have been successfully built with Blaw-Knox steel forms. The Engineering Service Department of the Blaw-Knox Co., 667 Farmers Bank Bldg., Pittsburgh, Pa., will be pleased to send you complete information regarding these steel forms for all types of concrete work.

A TRACTOR GRADER THAT CUTS COSTS

The Shawnee-30 grader, which combines the work of a tractor grader and scarifier, and which is used by paving contractors in many parts of the country, is described in the latest literature of the Shaw-Enochs Tractor Co., 2446 University Ave., S. E., Minneapolis, Minn.

A SLIDING-GEAR TRANSMISSION FOR ONE-TON TRUCKS

The Himico sliding-gear type transmission for Ford one-ton trucks, which entirely replaces the regular transmission, is described in full in literature which may be secured from Hinkley Motors, Inc., P. O. Box E-839, Detroit, Mich.

PORTABLE BELT CONVEYORS

Bulletin 1022 issued by the George Haisa Mfg. Co., Inc., 142nd St. & Park Ave., New York City, describes the Haisa portable belt conveyors, which are inexpensive, ruggedly built for heavy duty and are economical to operate and maintain.

A LIGHT-WEIGHT MACHINE FOR DIVERSIFIED USES

A compact, powerful machine for digging, ditching, grading, moving, handling, and back-filling, known as the Byers Bear-Cat crane, is described in full in the latest catalog of the Byers Machine Co., 480 Byamore St., Ravenna, Ohio.

HOW TO BUILD SMOOTH CONCRETE ROADS

Copies of the valuable paper on the construction of smooth concrete roads delivered by C. W. Connor, State Construction Engineer, Raleigh, N. C., at the 1925 Chicago Road Show, may be secured from the Heltsel Steel Form & Iron Co., Warren, Ohio, by those mentioning Contractors' & Engineers' Monthly.

MOVING DIRT WITH WHEEL SCRAPERS

Two trains of Baker-Maney Model D scrapers move 1,000 yards of dirt a day on usual hauls with only 5 men. Single trains move 500 to 600 yards a day with only 2 or 3 men. This Model D 1 1/4 yard pan scraper is described and illustrated in the latest catalog of the Baker Mfg. Co., 585 Stanford Ave., Springfield, Ill.

PROTECTING EXPOSED METAL

The service rendered by Dixon Silica-Graphite paint throughout the year on all exposed metal or woodwork is described in Booklet 148-B, which tells how to reduce paint costs and may be secured from the Joseph Dixon Crucible Co., Jersey City, N. J.

A WELL-BUILT WYE LEVEL

Folder T-5 issued by the Warren-Knight Co., 136 N. 12th St., Philadelphia, Pa., describes the Delaware River Bridge model Sterling engineers wye level as well as its complete line of transits and other scientific instruments for contractors and engineers.

RELIABLE TRACTORS

According to one user, the high operating efficiency of Best tractors and their freedom from frequent repairs make them machines that can be relied upon for general hard work. These tractors are described in full in a booklet, "Out of the Rat," issued by the C. L. Best Tractor Co., San Leandro, Calif.

EASY-TURNING STOP-COCKS

Curb and waste stops which have been accepted as standard by contractors and cities throughout the country for over 50 years are described in detail in the latest catalog of the Union Water Meter Co., Worcester, Mass.

A MIXER WITH TRACK LOADER

A mixer that can be mounted 10 or 15 feet above the forms and readily loaded from the ground by extending the tracks on which the loading skip runs, is described in the Wonder catalog issued by the Construction Machinery Corp., Vinton St., Waterloo, Iowa.

AN ECONOMIC AIR-COMPRESSOR OUTFIT

The Curtis air-compressor unit which is sold as a single unit or in conjunction with a Fordson tractor, making a complete mobile air-compressing plant, is described in full in the literature of the Curtis Pneumatic Machinery Co., 1771 Kienlen Ave., St. Louis, Mo.

A GASOLINE-DRIVEN UTILITY HOIST

The Lidgerwood utility hoist is a gasoline-driven unit with a 15-horse-power banded tractor engine which has a rope pull of 2,500 pounds at 115 feet per minute. This well-built hoist is described in the literature of the Lidgerwood Mfg. Co., 96 Liberty St., New York City.

COMPRESSED AIR MAKES WORK CHEAPER

Cutting concrete, digging clay, drilling rock, calking masts, cleaning buildings, driving sheet piles—all of these jobs and many more can be done quicker and cheaper with air power. A booklet showing Sullivan portable compressors and air tools may be secured from the Sullivan Machinery Co., 162 S. Michigan Ave., Chicago, Ill.

A ONE-BAG TILTING MIXER

A husky, over-size, powerful one-bag mixer for pouring concrete for bridges, heavy fountains and flooring, is described in the latest circular covering the Kwik-Mix 5-L mixer issued by the Kwik-Mix Concrete Mixer Co., Port Washington, Wash.

TRUCK HOISTS THAT DO NOT FAIL

The Heil Body and Hoist Catalog No. 140, as well as bulletins on Heil-Ford equipment, describing the well-known Heil dump bodies and Hydro-hoists as well as the new Heil mechanical hoist, may be secured without obligation by any contractor interested, from the Heil Co., 1243 26th Ave., Milwaukee, Wis.

AN EXCAVATOR THAT FITS THE SMALL JOB

The Insley excavator for shovel, ditcher or skimmer scoop work will handle the daily yardage required on the average-size job, and because of its mobility and speed of operation will get on the job, do the work, and get away just as rapidly as a larger and more expensive unit. This outfit is described in Bulletin No. 47, which may be secured from the Insley Mfg. Co., Indianapolis, Ind.

THREE-DRUM GASOLINE HOIST

A 3-drum gas hoist with bull-wheel swinger, powered with a 50-horse-power, 4-cylinder engine with free engine clutch and a particularly handy arrangement of the operating levers, is described in the literature of the Clyde Iron Works Sales Co., 29th Ave. W. and Michigan St., Duluth, Minn.

VALVES AND FIRE-HYDRANTS

Gate-valves for water, steam, gas, and oil, either hydraulically or electrically operated, as well as simple and efficient frost-proof hydrants, are described in the illustrated catalog of the Ludlow Valve Mfg. Co., Troy, N. Y.

STEEL TAPES INSTEAD OF WOVEN TAPES

The Lufkin "Banner," a good steel tape offered at practically the same price as high-grade woven lines, and much more accurate, is described in the catalog of the Lufkin Rule Co., Saginaw, Mich.

STEAM PILE HAMMERS

McKiernan-Terry 9-B pile hammers, which operate by steam and do their work quickly and effectively without injuring the pile, are described in Bulletin 31, which may be secured from the McKiernan-Terry Drill Co., 19 Park Row, New York City.

PLAIN FACTS ON DIET-MOVING

The Miami-Fordson one-man power scraper, which moves dirt more economically on grading, street work, and general contract work, is described in the literature of the Miami Trailer Scraper Co., 610 E. Clay St., Troy, Ohio.

INDUSTRIAL TRACTORS FOR CONTRACTING WORK

Modern progress calls for modern methods and modern equipment. In road building many progressive contractors are using the Monarch industrial tractor to advantage. These tractors are described in the literature of Monarch Tractors, Inc., Watertown, Wis.

THE SERVICE OF CAST IRON PIPE

National cast iron pipe which is made right and in both the sand cast and de Lavaud centrifugally cast types, will be quoted on application by the National Cast Iron Pipe Co., Birmingham, Ala.

CUT PUMPING COSTS BY CLEANING YOUR WATER-MAINS

The National Water Main Cleaning Co., Hudson Terminal Bldg., New York City, which has 20 years of experience in the water-main cleaning field behind it, will be pleased to quote prices on cleaning water-mains of all sizes, restoring the carrying capacity to that of new cast iron pipe.

HOW CITIES SOLVE THE WATER-WASTE PROBLEM

The free monthly publication of the Neptune Meter Co., 50 E. 42nd St., New York City, a 56-page magazine known as "AquaFax," gives information on how different cities are solving the water-waste problem through metering.

AN EFFICIENT BACK-DUMP SLACK-LINE BUCKET

The Pioneer back-dump bucket for slack-line work is a great money-saver for progressive contractors. This bucket is described in the literature of the Pioneer Bucket Co., successors to the Mansfield Engineering Co., Fletcher Savings & Trust Bldg., Indianapolis, Ind.

WATER-WASTE SURVEYS STOP LOSSES

The value of Pitometer water-waste surveys in locating leaks of all kinds in water distribution systems is appreciated by hundreds of cities that have taken advantage of this service, which is described in the literature of the Pitometer Co., 52 Church St., New York City.

WATER-METERS FOR ALL SECTIONS

The Tropic, an all-bronze water-meter with connection spuds attached to the lower case, particularly designed for warm sections of the country, and the Arctic, a frost-bottom water-meter especially designed for cold sections of the country, are described in the literature of the Pittsburgh Meter Co., 7800 Susquehanna St., Pittsburgh, Pa.

WHEELBARROWS FOR EVERY JOB

Wheelbarrows ready for delivery at a fair price and fitted for every contracting job, are described in the literature of the Puffer-Hubbard Mfg. Co., Minneapolis, Minn.

A TWO-SPEED AXLE FOR FORD TRUCKS

The Rackstell, a two-speed axle for Ford cars and trucks exclusively, which gives four speeds forward, two reverse, and traffic transmission, is described in the literature of the Rackstell Sales & Mfg. Co., 461 - 8th Ave., New York City.

TEXAS SERVICE FOR CONTRACTORS

The Texaco engineer is a handy man to know, as he travels around the country, knows the various specifications, tells you where you can get your material, and knows the history of the different types of machinery. Drop a line to the Asphalt Sales Dept., Texas Co., 17 Battery Pl., New York City, and they will pleasure to have the nearest Texaco engineer drop in to chat with you about prospective work in your territory, without obligation.

A New 18-Ton Gasoline Locomotive

Heavy Model Offered for Switching Railroad Cars and Handling Construction Cars

IN addition to the present extensive line of models and sizes of gasoline locomotives, the Fate-Root-Heath Company, Plymouth Locomotive Works, Plymouth, Ohio, has brought out a new model 18-ton gasoline locomotive for switching railroad cars and for handling large and heavy industrial and construction equipment. This locomotive is furnished in all track gages from 23½ to 56½ inches.

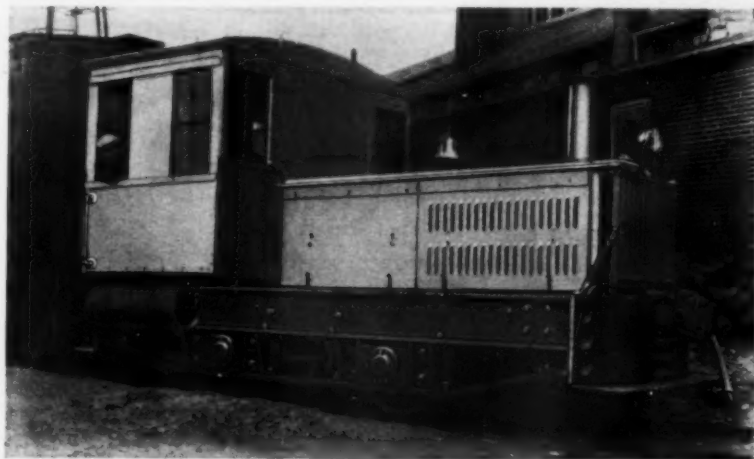
The new 18-ton model is built on very heavy lines and very substantially throughout, the foundation being an exceedingly heavy frame with steel girder beam and bar sides and cast steel bumpers of liberal dimensions, to withstand the severe strains and stresses thrown upon a locomotive in the service for which it is intended. The wheels, all four of which are drivers, are 33 inches in diameter with flange and treads suited to the type of track used, either standard railroad or industrial.

power. A 12-volt back-geared starting motor and a large storage battery afford a positive starting unit ready under all conditions. A Modine sectional spirex core radiator with 30-inch diameter fan affords ample cooling for this large engine under the heaviest kind of work.

The clutch is a combination of Twin Disc and Plymouth design. The faces are very wide, to insure positive contact when engaged and at the same time easy action when being engaged. A very valuable feature is provision through a drilled clutch shaft for lubricating the pilot bearing in the fly-wheel with an Alemite gun.

The transmission is the Plymouth standard sliding gear type, with four speeds both forward and reverse, providing speeds of 2½, 6, 12 and 24 miles per hour. This transmission embodies the Plymouth feature of the final driving-shaft and gear being used in the gear case and in addition a double

AN 18-TON
GASOLINE
LOCOMOTIVE



The axles are alloy steel, heat-treated, and fitted with Hyatt heavy-duty roller bearings with hardened sleeves to take the wear of the bearings, and the bearings are enclosed in dust-proof journal boxings carrying bronze thrust plates to take care of the thrust of the axle. Various size shims that space the journal boxes afford an excellent and easy means of chain adjustment. Two well-proportioned coil springs are provided with each journal boxing, effecting positive and easy spring action and easy riding of the locomotive.

The power-plant consists of a Climax R-6, 6-cylinder, vertical L-head engine with 5½-inch bore and 7-inch stroke, of the heavy-duty type with full force feed oiling system and a built-in governor. This is provided with a high-tension dual ignition system using both magneto and battery to insure positive service. A Stromberg M-5 carburetor with air cleaner is used which is especially designed for this size engine and the sudden demand for its full

reduction between the clutch and regular driving gears. The gears are all high-grade alloy steel cut and hardened with faces from 2½ to 5 inches wide and from 6½ to 28½ inches in diameter. All shafting and beveled reversing gears are carried on high-grade ball bearings mounted in, and lubricated automatically from, the inside of the gear case. This transmission is designed with the idea of eliminating the difficulties incident to the use of jaw clutches, and the gears are of such design as to insure long life.

Hand brakes of the hand wheel and screw type operating brakes on all four wheels are provided regularly for industrial service, and straight system air brakes are furnished when required, as are also Westinghouse automatic air brakes for railroad service. The sanders are air-operated, insuring a positive flow of sand through a large-size flexible sand pipe. This type of sander is furnished whether air brakes are supplied or not, in connection with an

air whistle which is standard equipment. In addition to the whistle, a bronze bell completes the signaling equipment. A 50-gallon fuel tank affords an ample supply for quite a wide operating range.

The cab is 11 feet high and 10 feet wide in the case of 56½-inch gage, affording the best possible vision alongside the train, as well as over the top of gondola cars or large industrial or construction cars. Two seats are provided for the operator, one for traveling forward and the other for traveling

backward, both located on the right-hand side with the clutch level operating from either position, enabling the operator to operate without inconvenience in either direction. Sliding windows are provided in the cab on both sides, front and rear. The cab, as well as the hood over the engine, is of steel construction, and both can be quite readily removed, should occasion require. The rear of the cab is closed with a swinging door opening into the middle of the cab.

A New Gas-Engine-operated Backfiller

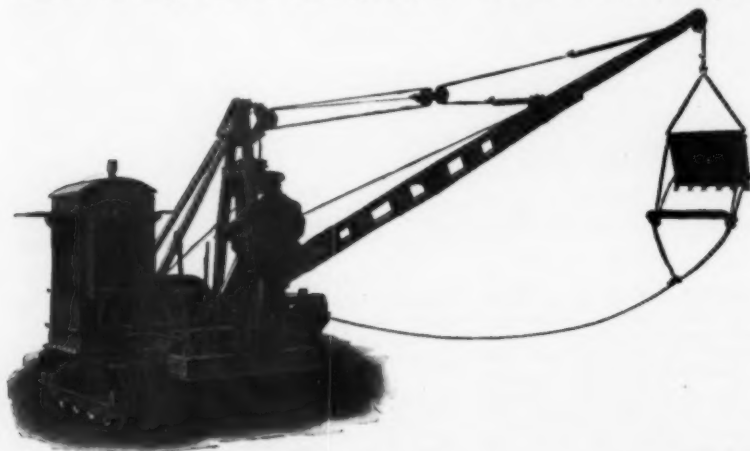
All-Steel Construction and Easy Control Feature New Machine

A NEW one-man backfiller run by a gasoline engine has recently been designed and placed on the market by the Harnischfeger Corporation, formerly the Pawling & Harnischfeger Company, Milwaukee, Wis. This machine has many interesting features, as, for example, an all-steel construction of heavy-duty parts; all the shafts are of steel, turned and ground to micrometer size, and all the gears and pinions are of steel and have teeth double cut from the solid blank. Every motion of the machine is controlled by friction clutches, giving easy control and quick movement. The corduroy shoes are of cast steel in one piece, and the pin holes are drilled out and not cored. The treads are full corduroy, each side being independently driven and steering made positive by using independent clutches and steering brakes.

The machine is readily controlled by one operator, since all the levers are closely grouped at the center of the machine and have a straight pull. The boom is adjustable in steps of 18 inches between 21 feet and 30 feet, and the change may be

made in a few minutes in the field. The boom has a half-circle swing, making possible a great amount of work from one location. The boom swinging and hoist mechanism are power-driven through worm gearing and controlled by a friction clutch. The scraper is self-filling, of heavy material and fitted with renewable steel teeth. The scraper has a working speed of 130 feet per minute and a return speed of 275 feet per minute.

The motive power is supplied by a 25-horse-power Waukesha motor equipped with a Ricardo head and cooled by a large radiator. The motor and gasoline tank are enclosed in a steel house which may be locked. This gives complete protection from the weather and from tampering. This backfiller may be mounted on a standard flat car or heavy truck without dismantling. It may be loaded or unloaded under its own power, thus saving a great amount of time and transportation cost. The total weight of the backfiller with the boom and scraper is 13,000 pounds. This machine is known commercially as the P & H Model 25 backfiller.



P & H
MODEL 25
BACKFILLER

Janda Assistant Director of Highway Research Board

CHARLES M. UPHAM, Director of the Highway Research Board of the National Research Council, has announced the appointment of H. F. Janda as Assistant Director. Mr. Janda has had a broad experience as Assistant City Engineer of Portage, Wis.; Instructor and Assistant Professor of Civil Engineering, University of Cincinnati; Associate Professor of Highway En-

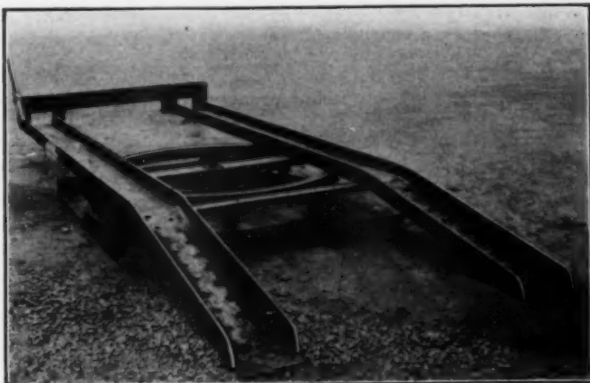
gineering, University of North Carolina; and has carried out many important research projects, including capillary moisture in highway subgrades, and earth pressure tests on culvert pipe. Mr. Janda will be located at the offices of the Highway Research Board in the building of the National Academy of Sciences and National Research Council at B and 21st Streets, Washington, D. C.

One-Man Turntables Save Time on Road Work

Sturdy Equipment Eliminates Another Waste in Road-Building Industry

BY using a motor-truck turntable in concrete road construction, the contractor can run his truck at its customary speed as near the paver as he wishes to place the turntable. He therefore saves the time formerly taken to turn the truck under its own power and back it a distance of 500 to 3,000 feet, depending on the conditions of the work. It is evident that a truck moving forward at the rate of 15 to 20 miles an hour can travel a distance of 2,000 feet from two or four minutes faster than if it was backed the same distance at 4 miles an hour. Ten trips per truck, therefore, mean a saving of from 20 to 40 minutes of truck time per day. It has been clearly demonstrated in time studies in highway construction that every hour's delay of the paver means a loss of at least \$50 in profits to the contractor. When the paver is held up because of lack of materials due to the delay of trucks in getting to the mixer, it can readily be seen that a good turntable will minimize the time lost by the concrete gang and thus add to the contractor's profits. While the truck is trying to turn under its own power, it is bound to cross the road and prevent attaining the maximum speed of the work.

Blaw-Knox turntables, which can be operated by one man on any reasonable grade, have materially helped many contractors in saving time on their road work. These turntables are built compactly with no small, delicate or complicated mechanism. by the Blaw-Knox Company, Pittsburgh, Pa. The 5-ton turntable can be operated easily by one man and it is just as easy to turn on the grade as on the level. The turntable occupies a space only 8 feet wide and at one side of the road, and in turning



A SIMPLE, EFFECTIVE MOTOR TRUCK TURNTABLE FOR ROAD WORK

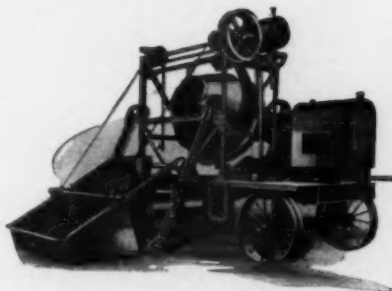
projects over the forms. This means that outgoing trucks have a free passage by the turntable at all times and there is no disturbance of the forms necessary for turntable operation. The turntable prevents all confusion of trucks meeting at the turning point and blocking the right of way. It makes possible much better time from the loading point to the paver. The turntable, being mounted on a skid, can be moved as occasion requires, without injury to the subgrader. This is accomplished by attaching a chain to a returning truck or roller.

These Blaw-Knox turntables are made in two sizes, 1½-ton and 5-ton capacities, and are shipped knocked down for assembly in the field. The 1925 models of these two turntables have been carefully simplified, the number of parts being greatly reduced, which means longer life with practically no maintenance expense and greatly simplified field erection.

A Light-Weight, Well-Built Mixer

Machine of 14-Cubic-Foot Capacity Has Power Discharge

A NEW mixer of 14 cubic feet capacity of the single-opening, tilting type has recently been developed by the Construction Machinery Company, Waterloo, Iowa, in its Wonder-14. This model is light-weight with sturdy construction, is quick-charging because of the large single opening, has a rapid and thorough mixing action and fast pouring discharge accurately controlled. The Wonder-14 is equipped with an efficient power discharge which has proved of considerable interest to contractors because of its smooth-working qualities, its positive action in starting and stopping the tilting action of the drum, and the unfailing disengagement of the end of the drum travel. In addition, this mechanism is so constructed that a batch may be split into any part as wanted.



A SINGLE-OPENING TILTING TYPE MIXER

Big Road Job in Widening Woodward Avenue Between Pontiac and Detroit, Mich.

"Wider Woodward Avenue," a Super-Highway Being Built by State of Michigan, with Traffic Capacity Greater Than Ideal Section of the Lincoln Highway



parison of its width is made with that of the Ideal Section. The famous Ideal Section has a paving width of 40 feet on a 100-foot right of way, allowing 20 feet on each side for the lines of traffic going in opposite directions. The Woodward Avenue pavement for the separated highways for traffic going in each direction will be 40 feet in width with curb and gutter, providing a full 44 feet of paving to be used for traffic. Already 3 miles of the westerly 44 feet of highway are in use.

There are unusual conditions surrounding the construction of this important link in one of Michigan's main arteries of travel. The conditions, how-

SCENES ON THE WIDER WOODWARD AVENUE JOB

Above—Site of Wider Woodward Avenue. At right—In many instances houses were moved back to new property lines and in some cases it was necessary to move entire business blocks. Below—An 8-foot shoulder on each side of the road provides space for a foot-path or, in undeveloped areas, a place for parking cars



THERE is in process of construction in Oakland County, Mich., between Pontiac and Detroit, a highway known as "Wider Woodward Avenue." This super-highway is being built by the state of Michigan on more generous lines than any other suburban highway in the country. That it has a greater capacity for traffic than the Ideal section of the Lincoln Highway may be easily appreciated when a com-

ever, are none other than those often found near great centers of population where traffic congestion is such that heroic measures must be taken to serve traffic. Woodward Avenue in Oakland is simply an extension of Detroit's main thoroughfare of that name. The road extends from the Eight-Mile Road, which is also the northerly limit of the city of Detroit, northwesterly through Royal Oak, Troy and Bloomfield townships to the southerly limits of the city of Pontiac, a distance of approximately 13 miles. When Michigan became a state, Woodward Avenue was laid out 100 feet in width, but, as time passed, encroachments and other conditions have reduced this width to less than 66 feet in some places. In this space there was located a double-track electric railroad, and closely paralleling the track was laid in 1916 a concrete pavement 16 to 18 feet in width. On either side of the highway as then built were numerous pole lines carrying electric telephone and other wires.

The old pavement when built was thought to be sufficient for a good many years. Traffic has increased so rapidly, however, that hundreds of acci-

dents have occurred, with the loss of a great many lives. A traffic census taken on the highway has shown a daily average count of 14,000 vehicles, with a maximum count of 21,000 vehicles passing a given point in 24 hours. The Grand Trunk Railway has a single-track road-bed adjacent and parallel to the electric railway on the easterly side for a distance of approximately 6 miles. This railroad is a handicap to the widening of the avenue toward the east. The Oakland County Road Commission has realized the inadequate condition of Woodward Avenue and for the last three years has worked to secure from the state the widening of this trunk line highway. At a session of the Legislature in 1921 an amendment to the present highway act was carried, and the necessary legislation was passed to make possible the construction of a pavement more than 20 feet in width. In the fall of 1923 Governor Groesbeck and Frank F. Rogers, State Highway Commissioner, ordered work started on the thoroughfare. That Seeley of Pontiac was given the task of securing the 200-

overs between the main pavements are made at approximately every third street for all secondary street openings. All streets have an opening on the new pavement adjacent to the intersections. When more than one street intersects Woodward Avenue at one point, cross-overs are provided with safety islands, so that traffic assumes a rotary motion in passing on or off the pavement.

The pavement is 9 inches in thickness and is be-



WIDER WOODWARD AVENUE UNDER CONSTRUCTION AND A COMPLETED SECTION

Above—Lifting batch-boxes from industrial tracks for the construction of 9-inch pavement of 1:2:3½ mix with ½-inch expansion joints at 50-foot intervals. At left—Another view of the mixer. Below—View of section of completed pavement 88 feet wide. The project will be complete in 1927

foot right of way for the state, and Leon V. Belknap, County Road Engineer, was placed in charge of construction, assisted by A. M. Comb, representing the State Highway Department.

Construction Plans

It is the plan to build the highway with two 40-foot pavements having combination curb and gutter on either side, making a travel area of 44 feet on each pavement, or a width of 45.3 feet back to back of curbs. These two pavements are parallel to the center line, with a distance of 69.3 feet between inside curbs. This spacing extends between the Eight- and Ten-Mile Roads. North of the Ten-Mile Road the distance between pavements is reduced to 38.7 feet. The Detroit United Railway Company's tracks are to be moved to the center between pavements. All important street intersections are at grade with the new pavement on the present plans. Grade separations between important cross-streets and Woodward Avenue may be made at some later date, but are not contemplated at present. Cross-



ing constructed of 1:2:3½ mix concrete. It is divided longitudinally in four 10-foot strips by means of longitudinal joints, thereby providing for four lines of traffic on either pavement with the traffic lines automatically built into the pavement. Transverse expansion joints ½-inch in thickness and 9 inches in depth are spaced 50 feet apart. The pavement is crowned 5½ inches. Gravel shoulders 8 feet in width are provided on the outside of both

pavements. The curb and gutter section is 32 inches wide, with a 4-inch curb. The curb has a width of 8 inches, with a 6-inch top and a 12-inch bottom radius. The back of the curb is 12 inches in depth, and the gutter section 9 inches in thickness. The curb is so designed that vehicles can pass over the curb to the 8-foot parking area. Drainage is provided by means of sewers with catch-basins and manholes. A special catch-basin cover of heavy section has been designed to fit the curb design.

Landscape plans will be devised to provide for proper tree planting. Telephone lines are carried in underground conduits, except for local service poles. Electric transmission and service lines will be placed in the center between car tracks used jointly as center-pole construction for trolley wires. All curves on the highway are reduced to one degree or less, with a maximum grade of less than 6 per cent. The Grand Trunk Railway tracks are to be relocated for a distance of approximately 6 miles.

The first steam shovel for grading was moved onto the Woodward Avenue right of way last fall, and between Birmingham and Pontiac, alone, more than 134,500 cubic yards of dirt has been moved. The grading contract for this portion of the highway was awarded to the George W. Smith Company. Delays in securing the right of way have prevented completion of the grading work over this section of the highway, but work is progressing rapidly as the right of way is secured.

Huge cuts have been made through the Stinchfield Hills section, and many curves have been eliminated. Those remaining are being held to one degree, one of them being a third of a mile in length. Several small lakes have been eliminated by filling, parts of several cemeteries have been moved back to new ground, and beautiful estates and business blocks alike have been moved to make this great highway possible. In eliminating the lakes which lay in the right of way, it was necessary not only to fill up the lakes, but to push the heavy muck out of the lake bottom and replace it with more substantial foundation in order that in future years there might be no settling of the roadway over which such a tremendous volume of traffic will pass.

The grading work has been made more difficult by the fact that it has been necessary to keep the old pavement open to traffic—far more traffic than it should be expected to carry, and also the tracks of the D.U.R. In many cases the earth has had to be moved across the Interurban tracks, complicating the task of the contractors.

The presence of the Interurban and Grand Trunk tracks has also forced the building of the new highway in sections along a considerable portion of the route. From Birmingham south to the Eleven-Mile Road, a 20-foot pavement will be constructed along the west side. When this 20-foot strip is completed, the old pavement will be torn up and an-

other 20-foot strip will be laid, completing the western side of the highway. The 40-foot strip on the east side will be built as soon as the Grand Trunk tracks can be moved. South of the Eleven-Mile Road, it was necessary to secure the right of way almost entirely on the west side of the present pavement, and this forced the buying and moving of many business blocks, as well as residences and other buildings.

Last spring the R. D. Baker Company was awarded a contract to pave the west 40-foot strip from the Eight- to the Ten-Mile Road, and this contract was later extended to include the third mile to the Eleven-Mile Road. Thus far, three miles have been completed from the Eight- to the Ten-Mile Roads. There is a short strip at the Nine-Mile Road which cannot be completed, as a few stores remain on the right of way, but with this exception, the first three miles are completed on the west side and are in use to-day. The task of constructing these three miles alone involved an immense amount of work, even though the largest fills and cuts occur between Pontiac and Birmingham. Already, between the Eight- and Ten-Mile Roads, 26,000 cubic yards of dirt have been moved and 69,000 square yards of pavement laid with 29,800 lineal feet of curb and gutter. In addition, sewers, manholes and catch-basins have been installed complete on the western half of this portion of the highway. A portion of the contracting machinery for this job, including the Milwaukee industrial locomotive, Best tractor and Rex mixer, was furnished by the Contractor's Equipment Company, Inc., 5163-9 Martin Avenue, Detroit, Mich.

A contract for all sewer and curbing which can be done at the present time between Birmingham and Pontiac, has been awarded to Bartling & Dull of Pontiac, and already 16,000 lineal feet of curb and gutter have been completed, in addition to 80 per cent of the sewer work. The condition of some of the fills has made it necessary to wait until spring to complete this part of the work. The White Construction Company of Milwaukee, which has the contract to pave all the graded portion between Pontiac and Birmingham, are already pouring concrete. The crews of the White Construction Company, started pouring at Bloomfield center and are working north toward Pontiac through the Stinchfield Hills. The Interurban tracks through these hills were relocated during the winter, so that paving work may now proceed with less delay. From Pontiac to within a mile of Birmingham, only Interurban tracks and the old pavement lie in the way. With the relocation of the tracks during the winter, it will be possible to pave all of the roads with the exception of that covered by the present pavement during the current construction season, unless unforeseen difficulties are met. There are 611,000 square yards of paving already in between Pontiac and Detroit, which is equivalent to 52 miles of 20-foot paving.

Noble Now Represents Sullivan Machinery Company

THE Sullivan Machinery Company, 122 South Michigan Avenue, Chicago, Ill., has announced the appointment of the K. B. Noble Company, 247 Pearl Street, Hartford, Conn., as its special and exclusive representatives to handle Sullivan portable and stationary air-compressors, hammer drills and rock drills, drill sharpeners, portable hoists, concrete breakers, and clay spaders in the territory covered by the entire state of Connecticut and by Massachusetts, including Wor-

cester County and west. The K. B. Noble Company since 1913 has specialized on air-compressors and tools, and its engineering department and experience are now devoted to Sullivan interests. The K. B. Noble Company will maintain stocks of Sullivan machinery and repairs for them at their warehouses at Hartford. The location of the main Sullivan plant at Claremont, N. H., will also facilitate prompt service to the Noble Company's customers.

Concrete Construction at 16 Below Zero in Milwaukee

By P. W. Koeppel

LOCATED on the choicest business corner in the city, on Milwaukee's main street, Grand Avenue, the Plankinton Arcade, now a two-storied building, is being increased to seven floors. Ten years ago, the building as it now stands was erected—a block wide and a half-block long, and two stories high. The plans called for a building of undetermined height. The foundation and the first two floors were erected at that time with the understanding that more floors would be added later.

In spite of the coldest December that has ever been experienced in the history of the Milwaukee Weather Bureau, when temperatures of 16 below were recorded, no particular difficulties were experienced by the S. M. Siesel Company, Milwaukee, construction engineers, in erecting the five-story addition to the Plankinton Arcade.

The total cost of this addition is more than \$1,300,000. The extra precautions which were taken to keep the concrete from freezing added but a trifle to this cost.

All floors and the roof have been constructed by the Milcor steel dome fire-safe method of long-span reinforced-concrete joists, using heavy gage, corrugated 8-inch plus 2 and 10-inch plus 2 Milcor

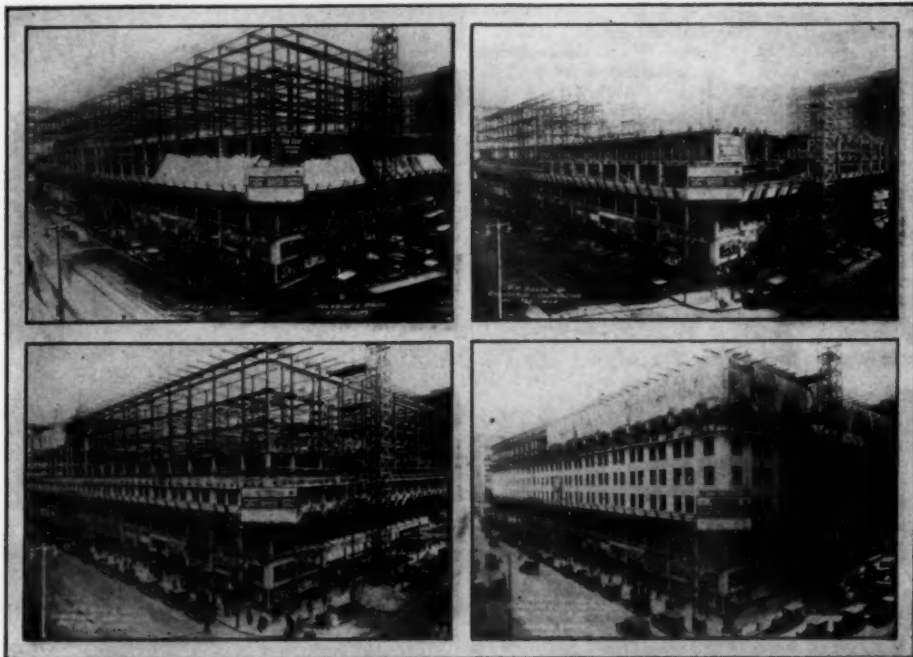
steel domes, making the concrete joists 5 inches, 25 inches on center, the concrete floor slabs having 0.326 cubic feet of concrete with the 8-inch domes and 0.376 cubic feet of concrete with the 10-inch domes.

Because the Arcade is 422 feet long and 200 feet wide, with an exceptionally wide court in the center, it was thought impractical to put in a central concrete plant with tower and bins, for the amount of concrete used in the large area was comparatively small. Instead, four double cage towers were put up, one at each of the four corners, with a mixer at each tower.

By having the sand and stone delivered as needed, stock piles were eliminated. Both the washed sand and the crushed limestone which were used were heated.

At times, when it was thought necessary, a steam line was run directly into the mixer. The water going into the mixer was heated by a central boiler which furnished the water for all four mixers.

Tarpaulins were used for protection against cold while the concrete was being poured and afterward. During the pouring, both the floor beneath and the floor being poured were enclosed with tarpaulins.



PROGRESS OF CONSTRUCTION

Upper left—May 15, 1924. Upper right—November 1, 1924, showing another end of the building. Lower left—December 1, 1924. Lower right—December 13, 1924, showing enclosure of canvas for concreting in cold weather

After pouring, the section poured was enclosed with tarpaulins. Salamanders were put underneath.

The same Milcor steel domes were used for

pouring all five floors and the roof. Thus, although the total floor space is 240,000 square feet, only 22,000 lineal feet of the domes were required. Holabird and Roche of Chicago are the architects.

A Foot-Valve and Quick-Cleaning Strainer for All Types of Pumps

Simple, Effective Device a Boon to Contractors

IT is conceded that no pump can work properly with its suction choked, and furthermore that most of the unsatisfactory service on the part of a great many pumps is due more to choked strainers which cannot be reached and cleaned than to all other causes combined. The Emerson quick-cleaning strainer, made by the Emerson Pump & Valve Company, Inc., Alexandria, Va., is raised and lowered by ropes so that the whole operation of raising, cleaning and lowering it into position again takes scarcely a minute, does not require the removal of a single bolt or the use of a tool of any kind, nor does it disturb the suction pipe in any manner. By the use of this foot-valve and strainer a pump is insured at all times a full and clean opening for the flow of water into the suction pump or intake without causing the pump operator any inconvenience or trouble worth mentioning.

The foot-valve proper is made extra heavy and has many advantages. Although the valve-gate has no spindle, spring or hinge, it operates freely in heavy guides cast in the valve body. This not only provides a simpler, more durable and substantial construction, but obviates effectively all the troubles which are caused in other types of foot-valves by the cramping of the gate or the breaking or bending of the spindle or hinge when solid substances such as stones or chips lodge under the valve-gate. This feature also makes possible large and generous openings through the valve with only a low lift of the gate, and prevents "hammering" or shocks. The waterways are just as free and unobstructed as those in types using ball valves, and their combined areas are one-third greater than that of the pipe on which the valve is used. As water enters the valve at the bottom, a pump equipped with an Emerson foot-valve is enabled to take practically all of the water from a pit or sump before air can enter the suction pipe. The valve-gate has a

leather facing which is held in position by a plate and cap screws and may be easily removed when necessary. Valves in sizes above 5 inches are made with a double-seat gate so as to allow a greater area with a low lift of gate.

The strainer is made of heavily perforated flange steel. The perforations are $\frac{7}{8}$ -inch in diameter in all sizes of the strainer above 4 inches, and $\frac{3}{8}$ -inch in smaller sizes. It is riveted to a substantial top casting, having a collar which fits loosely around the suction pipe so that it may slide up and down without cramping. The suction pipe acts as a guide. As the combined areas of the perforations greatly exceed the area of the suction pipe on which the strainer is used, a free and ample flow of water is always assured. The collar on each of the large sizes is made in sections which are bolted together so that it may easily be adjusted over a flange pipe. The strainer is made to withstand all kinds of rough service.



EMERSON FOOT-VALVE
WITH STRAINER IN
RAISED POSITION



THE COMPLETE PARTS OF A FOOT-VALVE AND QUICK-CLEANING STRAINER

Protecting a Heavy Concrete Structure from Seepage

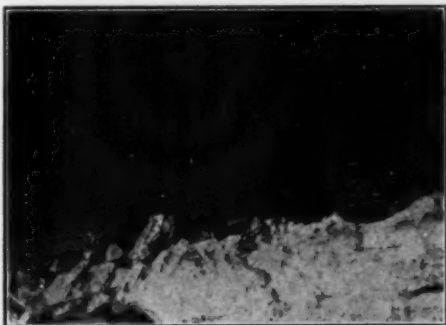
Large Gravity Dam in Maine Made Tight

A RATHER unique piece of work in solidifying and protecting a heavy concrete structure against further damage was worked out by the Cement Gun Construction Company, 537 Dearborn Street, Chicago, Ill., on a gravity concrete dam across the St. Croix River in Maine. The success which attended this effort shows that inherent defects in a mass concrete structure can be remedied under extreme adverse conditions.

In order to control the water level behind the dam, concrete brackets 5 feet apart and 10 inches thick were cast on top of the main structure, in which 2 x 10-inch planks were laid loose. There



A PORTION OF THE DAM NEAR THE CORNER, SHOWING STREAMS OF WATER ISSUING THROUGH THE FISSURES



CLOSE-UP OF DAM, SHOWING EROSION OF CONSTRUCTION JOINT

was always more or less seepage through the cracks between these planks, which was in part stopped by the customary procedure of throwing boiler cinders into the water and allowing them to silt up the cracks.

Because of the difficulties in constructing this dam in extreme cold weather, there were inherent defects in the dam which permitted a large amount of leakage through the body of the dam itself. This amounted in volume all the way from a trickle due to seepage to actual streams spurting out from the face of the dam to some distance. The action of frost during a period of years on

both the water coming through the flash-boards and running down over the down-stream face and on the water coming through the body of the dam, was such as to tear away large pieces of concrete on the down-stream face. This damage became progressively worse each winter. Investigation by a diver showed no bad deterioration on the up-stream face, which was continuously under water below the bottom line of the flash-boards. The first thought was to fill up the holes on the down-stream face and then cover the surface with a smooth facing by means of cement guns. Obviously, this would have been a temporary expedient of very questionable value so long as the body of the dam was saturated with water which would freeze and push off the Guncrete facing.

To dewater the lake above the dam was very expensive, and to coffer-dam the up-stream face was a matter of extreme difficulty owing to the water-logged timber and other rubbish that had accumulated. It was decided to solidify the body of the dam by impregnating it with cement grout. One of the difficulties anticipated was the slime which covered the down-stream face and extended into the cracks and crevices to an unknown depth. This slime must necessarily be removed before the im-



THE DAM AS COMPLETED DECEMBER 1, 1924

Only the left-hand portion was completed in 1924, the remainder being left to another year

pregnating cement or grout would bond to the old concrete. Another difficulty was the stoppage of the leakage through the flash-boards which ran down the down-stream face.

A movable coffer-dam was built in sixteen-foot sections and floated into place. The pressure of the water held it firmly in place after removing the flash-boards, and what little leakage there was through the coffer-dam was gathered into the gutter and piped free of the down-stream face with a 2-inch iron pipe. By impregnation under heavy air pressure, the structure was first cleared of slime with a weak solution of potassium permanganate, which quickly oxidized the slime wherever found, leaving the surfaces clean. Cement grout with various admixtures of accelerating or retarding compounds was then forced in until the down-stream face was entirely dry.

The dam itself consisted of two wings at right

angles to each other, one about 300 feet long and the other about 1,200 feet long. It was the short leg of the dam that was in the worst condition, so this was treated first. The grouting process was continued until the leakage and seepage stopped, so that the down-stream face was dry. Reinforcing mesh and rods were then secured to the face by means of anchor bolts. Guncrete, consisting of one part portland cement and $3\frac{1}{2}$ parts of sand, was then shot into place, filling all cavities and coating the entire surface. Before applying the Guncrete, it was quite definitely shown by various investigations that porosities, cracks and crevices were definitely filled and sealed. It is believed, therefore, that not only is the down-stream face thoroughly protected against further action by frost due to penetration of water flowing over the down-stream face over the flash-boards, but the body of the dam has been thoroughly solidified and is now truly monolithic.

A New Light-Weight Industrial Crane

Outfit with Interchangeable Attachments Can Be Used as Shovel or Dragline

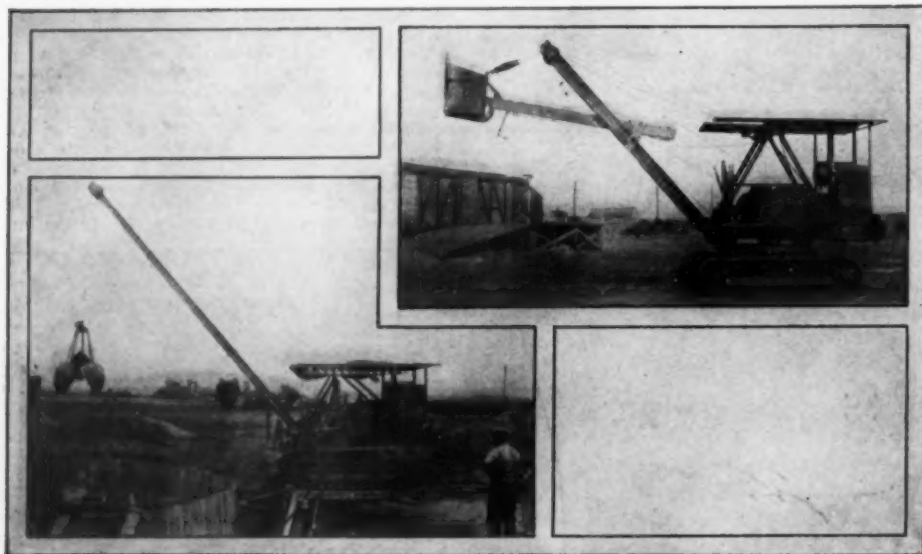
A NEW light-weight industrial crane with interchangeable attachments so that it is equally effective as a crane, as a shovel or as a dragline, has recently been developed by the Speeder Machinery Corporation, Fairfield, Iowa. The crane is of the full-swing type and can handle a half-yard clam-shell or dragline on a 26-foot boom or a half-yard shovel. To change from a crane or a dragline to a shovel it is only necessary to change the boom, requiring a few minutes' time. A reversible cable crowder is used with the shovel.

This outfit is provided with two speeds on the drum, as well as the traction, both forward and reverse, giving plenty of power for adverse conditions. The drums are also provided with steel lagging, so the cable speeds can be easily changed. There are three main drums and a boom hoist drum,

which may be controlled independently, or the holding drum can be controlled automatically in connection with the hoist drum for clam-shell work.

This Speeder crane is mounted on full crawlers which have sufficient length and width to allow the machine to operate readily in boggy places. The weight on the bearing surface is only about $5\frac{1}{2}$ pounds per square inch. The weight of the crane complete is 18,000 pounds. The crane can also be mounted on a truck when this type of equipment is desired, but under most conditions the manufacturers claim it is more satisfactory to carry it long distances on a light trailer.

All the controls are banked in front of the operator, so that it is not necessary for him to leave his seat for any operation. The operator's seat is placed so that he faces his work at all times.



LIGHT-WEIGHT, INTERCHANGEABLE CRANE AND SHOVEL



“Motorized with ‘Caterpillars’”

When you hear that said of a big job, you may be sure of two things—

that the work will be finished “on time”

that it will be put through at the lowest possible cost.

J. J. McCaughey Company's success with “Caterpillars” on the Marquette Park project in Chicago has been an eye-opener to wide-awake contractors, engineers, and public officials who have closely observed its progress. The big fleet of 10-Ton “Caterpillars” has with ease handled jobs that no other power could do; and at a remarkably low cost of operation and maintenance.

The “Caterpillar” line offers the last word in strength, low cost of operation, and long usefulness. It's cheaper than stock. It's more dependable than any other power. Facts prove it.

Check up now on your equipment. Handle your 1925 contracts with “Caterpillars” and thus be sure you have enough power and enough Traction, with the lowest cost for fuel and upkeep. You won't have to “favor” the “Caterpillar.” Give it reasonable care and it will do the work. Public officials, engineers, and industrial users have proved this everywhere.

THE HOLT MANUFACTURING COMPANY, INC.
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Export Division: 250 W. 54th Street, N. Y.



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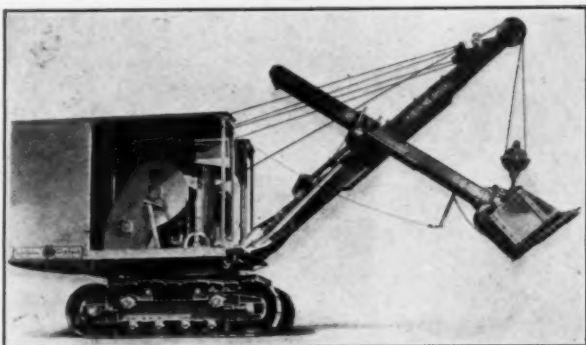
A Heavy-Duty $\frac{3}{4}$ -Yard Shovel

Gasoline-driven Unit Has Independent Crowding Action

A NEW heavy-duty Shovel No. 1, made by the Koehring Company, Milwaukee, Wis., has a crowding action entirely independent of its other functions and an extremely high lift. The lift is effected by providing the shovel with a short boom and a long dipper stick, which, when crowded out, reaches far beyond and above the end of the boom. Crowding is accomplished by means of cables attached to opposite sides of the reversing forward drum of the machine, leading down around flouting sheaves at the boom axis point, and from there to opposite sides of the drum on the shipper shaft. The power used to crowd out the dipper is from the same powerful gasoline engine used for all other functions.

When it is applied to crowding, its entire force is concentrated there, giving an ample reserve margin for anything the shovel undertakes.

The self-cleaning, easily lubricated multiplane traction has been designed with large ground surface to give adequate tractive power. The shovel is equipped to handle a $\frac{3}{4}$ -cubic-yard dipper, struck measure, or a $\frac{7}{8}$ -yard dipper, heap measure. The boom is 19 feet 6 inches long, with a 16-foot dipper stick. The clutches are of the double outside band friction type, giving immense clutching power, and all the frames, bearings, gears, sheaves, base plates, rollers, etc., are made of high-grade materials to give them long service life and insure freedom from breakdowns and consequent delays.



GASOLINE-DRIVEN POWER SHOVEL WITH POWERFUL CROWDING EQUIPMENT

The parts are refined to the smallest details in carrying out these heavy-duty principles. A 4-cylinder, 5 x 6-inch, 1,000-r.p.m. Wisconsin gasoline motor especially designed for shovel work is used on this No. 1 shovel.

The boom can be raised or lowered at will by the operator by merely shifting a lever, without any readjustment of rods and cables or any other operation. All levers are handily placed to be within easy reach of the operator. The levers yield to the slightest finger touch, facilitating operation and making a satisfied operator, who, because of the ease and simplicity with which his machine works, is capable of producing a greater yardage with it each day.

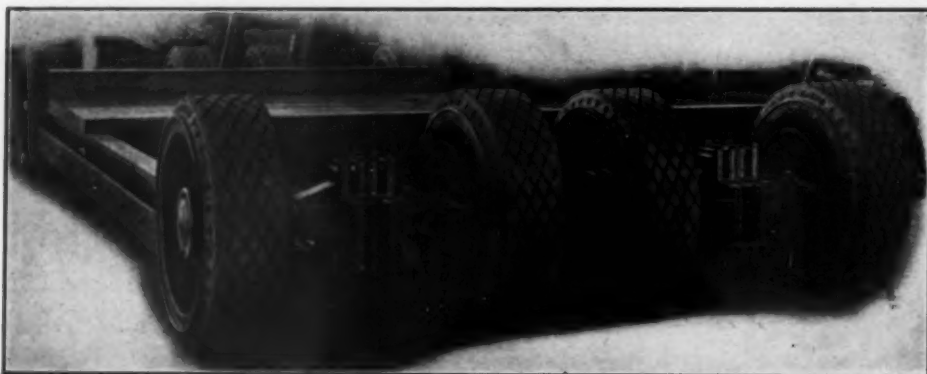
An Eight-Wheel Trailer

Transportation Unit Capable of Carrying Large Traction Shovels and Pavers

ONE of the features at the Chicago Road Show in January was the huge 30-35-ton 8-wheel trailer exhibited by the Highway Trailer Company, Edgerton, Wis. The trailer can easily

carry large traction shovels and pavers, making it possible to haul them at reasonably high speed from job to job.

Two axles are used in the rear and two in the



REAR VIEW OF 35-TON CAPACITY, 8-WHEEL TRAILER

Re-Surface with Kyrock and Save One-Half



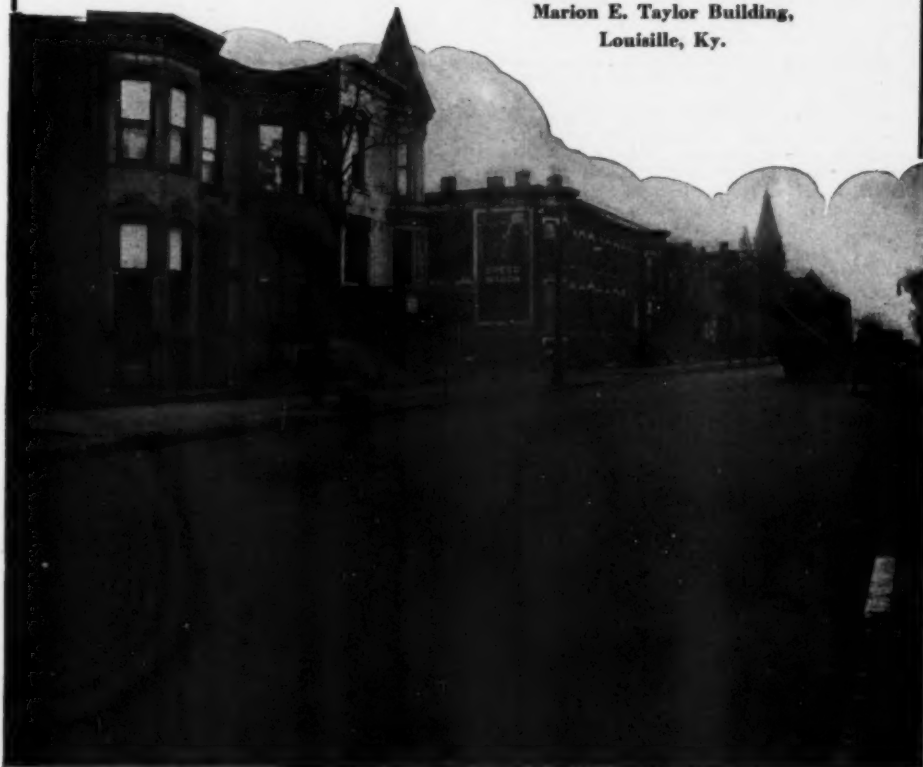
Hundreds of miles of Kyrock re-surface, on old macadam, gravel, brick and asphalt, have been giving service equal to complete new pavements, over a long period of years.

Kyrock surfacing is the most practical and economical because of its long life and simplicity of construction. It is a natural product shipped ready to lay cold, on any standard type of base. Below is shown a section of Washington Blvd., Chicago—old macadam surfaced with Kyrock and subject to very heavy traffic. Literature on new construction, re-surfacing and patching will be sent on request. Ask for Booklet C. E. M.

Kentucky Rock Asphalt Company

Incorporated

Marion E. Taylor Building,
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front on this trailer, each axle being suspended from the center, so that the pressure on each wheel is uniform when the trailer is operated over crowned roads or over roads having an uneven surface. The knuckle steer principle is carried out on the front of the trailer, so that perfect steering takes place when it is being pulled behind a motor truck or tractor. The 35-ton trailer is equipped with a 4-inch oak platform, 11 feet wide and 15 feet long, mounted 27 inches from the ground.

The trailer can be loaded from either side, loading ramps being provided for that purpose. This trailer is also made in 30-ton capacities using 36 x 14-inch wheels and tires and 2-inch oak decking with a low loading height of 23 inches from the ground. The wheels on the larger unit are 40 x 14-inch and the tires 40 x 14-inch Goodyear A. W. T., four on the rear and four on the front. This larger trailer weighs approximately 20,000 pounds.

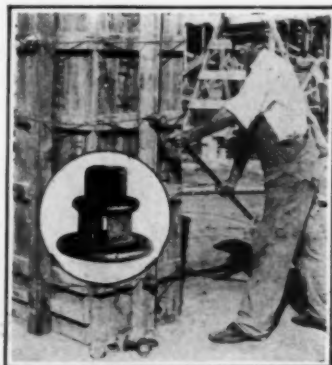
A Simple, Effective Form Clamp for Columns and Walls

Heavy-Gage Wire, a Small Clamp Device and a Wrench Prove Effective

A FORM clamp that can be used equally well for walls, square columns and round columns is a handy tool for the building contractor. The Bullis form clamp, manufactured by the Washington Steel Form Company, Woodward Building, Washington, D. C., is a very simple device, as may be seen from the illustration opposite.

To apply one of these clamps to a column or wall form, it is necessary only to pass a heavy-gage wire loop through the wall form or around the column. The ends of the wire are then threaded through the slot in the center of the clamp and the clamp turned with the wrench until the wire loops are tight. Then, to prevent the wire's slacking, all that is necessary is to drive nails through the holes in the base of the clamp. This form clamp is all in one piece, requiring no screws, bolts or parts, to be lost or broken. In using it on columns, the wire loops are spaced about 1 foot, 6 inches, to 1 foot, 10 inches apart and over the battens.

For round columns the forms can easily be made on the job by assembling narrow beveled strips over circular diaphragms. The wire loops are then spaced about 8 to 12 inches on centers and tightened with the Bullis clamps. Then the diaphragms can be knocked out, leaving a rigid, round column form of wood which will support the slab or beam



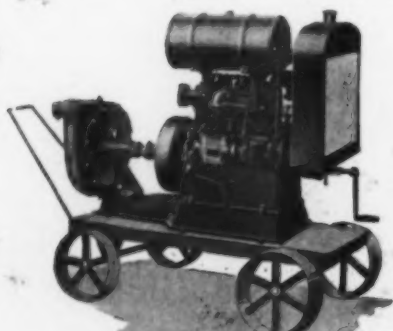
A BULLIS CLAMP, AND THE METHOD OF USING IT

forms without extra top or framing.

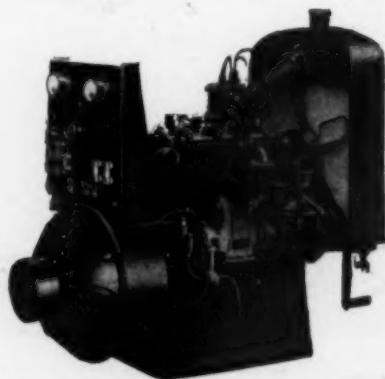
In using these clamps, it is well to stagger the clamps on all four sides of the column or spirally around the circular column.

Handy Units for Construction Jobs

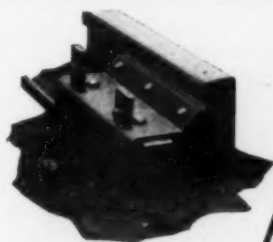
Universal Motor Company's Flexifour Engine-powered Units



PORTABLE PUMPING UNIT WITH FLEXIFOUR ENGINE



A 4-K.W. LIGHTING UNIT FOR CONTRACTORS



Free!

"The Greatest Fault in Road Building Practice Is Poor Form Setting and Maintenance."

From Editorial Eng. News-Record, Feb. 19, 1925

Write for bulletins on the following:

Steel Road Forms, Sidewalk Forms, Curb-and-Gutter Forms, Batch Boxes, Tool Boxes, Mortar Boards, Rotary Floats, Finishing Machines, "Lightning" Leaders.

Never before has the attention of state highway officials and contractors been concentrated so persistently on road form construction and maintenance.

Never before have contractors faced specifications so rigid, all supporting the theory that country roads can and should be as smooth as city streets.

Requests for this important treatise are coming by the hundreds. Contractors everywhere have a right to know what will be demanded of them in future highway paving.

Mail the coupon for your copy before our present supply is exhausted.

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CUB ROLLER EQUIPPED WITH SPREADER AND SCARIFIER

A Cub Roller with Fordson Power

Complete Equipment for Diversified Work

A NEW piece of equipment with a broad field of usefulness in hauling, scarifying and rolling, has been brought out by The Good Roads Machinery Company, Inc., Kennett Square, Pa., in its Monarch Cub roller made in 4- or 5-ton sizes and powered with a Fordson tractor.

This unit, as illustrated, is equipped with leveler and scraper, made up of a 7-foot, 9-inch blade, extending across the front of the roller and held by two tubular braces attached to the frame. These braces are telescopic and, being drilled with holes properly spaced, permit the blade to be set at different scraping and spreading angles. Each end of the blade is attached to lift rods which are operated by a worm-and-gear mechanism attached to either side of the front of the roller through two shafts and two crank wheels, located at the rear of the roller, convenient to the operator. The two sets of mechanisms work as separate units, thus permitting either end of the blade to be raised or lowered independently of the other. The value of the leveler and scraper is found in the fact that it will act as a scraper in cutting off bumps in the roadway and as a leveler and scraper in moving and leveling earth, slag, gravel, cinders, crushed stone, and similar materials.

The scarifier of the Monarch Cub roller is furnished in two different models, one having three teeth and the other seven teeth. The three-toothed

scarifier operates between the rear compression rolls of the roller and will break up a section of hard roadway 24 inches in width. The seven-toothed scarifier is designed along the same general lines as the three-tooth, except that the tooth holder beams are located back of the rear compression rolls and extend the full width of the roller. This wide scarifier has been designed to make it possible to scarify close to the forms in subgrade work and also to break up a highway close to the curb where necessary. For tearing up the subgrade, dirt and cinder roads and any light materials, the seven-tooth-scarifier is recommended, and where it is desired to scarify hard material it is believed that better results will be obtained by using the three-toothed type.

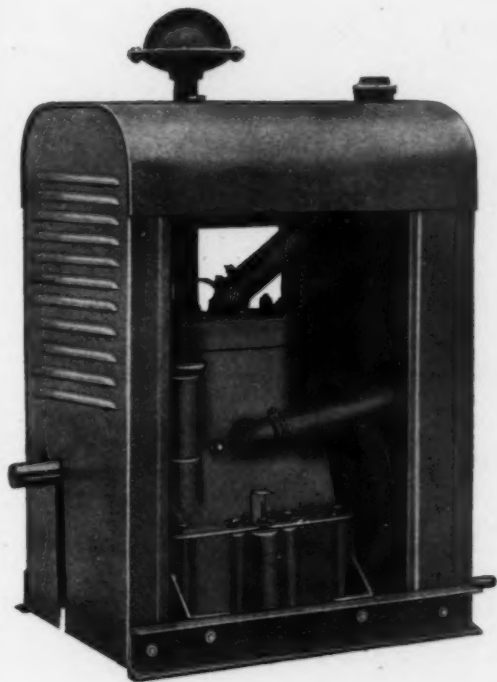
The scarifier teeth are made of 1 x 2-inch high-carbon steel, and, being pointed at both ends, are reversible and will afford double wear. They can be conveniently adjusted to various depths and are easily taken off for resharpening. The teeth are spaced about 9 inches apart, and when in operation are set at an angle of about 40 degrees with the road line. By turning the teeth over in the clamps, the angle of the point will take a different angle with the road line. The raising and lowering of the scarifier teeth is accomplished by means of a worm and gear through a hand wheel convenient to the roller operator's seat.

Book Review

The Growth of American Trade Unions, 1880-1923.—By Leo Wolman, Staff of the National Bureau of Economic Research, Inc., with a foreword by Wesley C. Mitchell, National Bureau of Economic Research, Inc., New York. 1924. 170 pp. Diagrams and tables. \$3.

This very interesting study of the growth of those aggregations making up the organized trades of the United States to-day is published under the auspices of the National Bureau of Economic Research, Inc., which is an organization especially designed for fact-finding and so constituted as to safeguard its findings against all bias, since each of the reports compiled by its staff must, before publication, be reviewed by a board of directors, twenty in number, representing widely divergent interests and points of view. This volume contains a wealth of figures, of which the following are typical: the membership of each union, year by year, from 1880 to 1923; the sources of trade union strength and weakness; the unions which are increasing in membership

and those which are decreasing; how union membership moves with respect to the business cycle, as well as how great strikes have affected various unions; how the working population is divided as to employers, salaried persons and wage-earners, and the proportion of the working population which is enrolled in trade unions; which industries are most highly organized and which are least organized, and the extent of organization among so-called "professional" workers and among public service employees. This book, for the first time, shows the membership of independent unions and of those affiliated with the American Federation of Labor for the period from 1897 to 1923. Comparisons are also made between membership in the United States and in foreign countries from 1910 to 1923. The price of this book simply covers the cost of printing and distributing. The National Bureau of Economic Research, Inc., 474 West 24th St., New York City, is to be congratulated upon this valuable contribution to trade union literature.



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The Building of Better Wheelbarrows

A Wheelbarrow Is Not "Just a Wheelbarrow" Any More

THROUGH careful standardized construction and attention to detail, manufacturers are now building wheelbarrows which can be guaranteed to stand up under the rigorous treatment of laborers. The Sterling wheelbarrow, made by the Sterling Wheelbarrow Company, Milwaukee, Wis., is built scientifically to reduce the effort of wheeling and to withstand hard service.

Pre-lubricated fiber bearings are built in each end of the hub to supply permanent lubrication. The bearings are guaranteed for the life of the barrow. The hub is sealed and the shaft is round cold-rolled steel in place of the common bolt. The shaft is locked to the malleable bracket by means of split pins. The spoke-holes are tapered so as



A GENERAL-PURPOSE BARROW FOR CONTRACTORS

to bring the spoke head within the tire, making a smooth tire on the outside instead of the bumpy affair found in many old-type barrows.

The Sterling wheel has ten spokes instead of the usual eight spokes, thus shortening the distance between spokes and materially strengthening the tire. The manufacturers believe that no piece of equipment is any stronger than its weakest part and that proper balance of weight and strength is necessary in building a wheelbarrow. The handle clamps of the Sterling barrow strengthen the handles at the point of most strain. The wrought iron handle tips are interchangeable on all handles. The riveted V-braced legs have steel shoes to increase their life; thus each vital part of the barrow is strengthened and given proper balance.



A MORTAR AND CONCRETE BARROW WITH WHEEL-GUARD

A New 2½ - to 3-Ton Truck for Contractors

Job Built Oversize Throughout

THE new Harvey 2½-3-ton truck designed for low operating cost, with oversize parts and every portion easily accessible, is made by the Harvey Motor Truck Works, Division of William E. Dee Company, Harvey, Ill. The two-range transmission of this truck gives seven speeds forward with two reverse, providing great power combined with higher speed without increasing the motor speed. The motor revolves 87.9 times in low speed to the rear wheels' once, with 9¼ to 1 reduction in the rear axle.

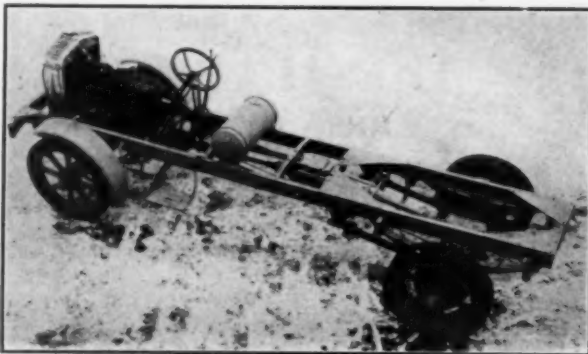
This new model on which the Harvey Motor Truck Works are specializing is equipped with a Buda EBUI high-speed motor with counterbalanced crank-shaft. The clutch is of the Brown-Lipe dry disc type and is rated at 5 tons capacity. The transmission is also Brown-Lipe and is rated at 3½ to 4 tons capacity.

All spring shackle-bolts, shackle-shafts, and radius-rod pins, are made of a high-grade nickel chrome steel hardened and ground. All wearing parts, such as spring shackles and radius-rod connections, are bronze-bushed. The Alemite high-pressure lubricating system is standard equipment. The chassis is built in four bases—125 inches for tractor work,

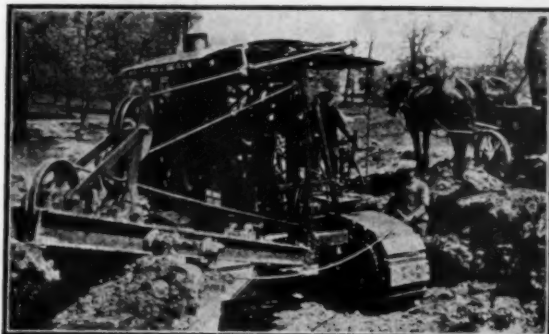
150 inches for dump-trucks, and 160- and 175-inch wheel-base.

The chassis is equipped with 36 x 5-inch front solid tires and 36 x 10-inch solid tires, which are considerably oversize, from a standard equipment point of view, for a truck of this capacity. Pneumatic tire equipment is furnished upon request at additional cost.

The greater range of speeds materially improves the operation of a truck, as it enables the driver to use the speed best adapted to load and road.

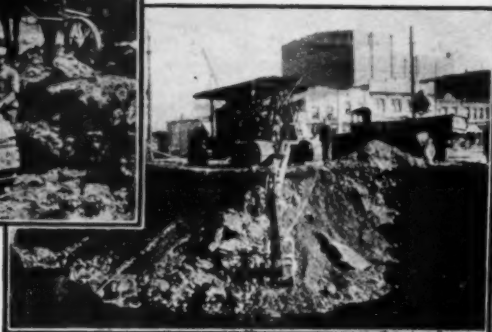


CHASSIS OF HARVEY TRUCK



Above—Model 4 Keystone, Steam Drive, with $\frac{3}{4}$ -yard Skimmer. The bucket with a 14-foot crowd and a ten-ton thrust.

Below—Model 4 Keystone, Gas Drive, with Pull-stroke Ditcher Bucket. It stands on the solid and cuts any width or depth to 20 feet.



These are Original Keystone Features



42 Years of Fair Dealing

The Keystone Driller Company was born on Ground-hog Day, 1882, and still it sees its shadow grow.

Write for prices and descriptive literature

THE original and out-standing Keystone ideas in earth excavation are the *Skimmer Scoop* and *Pull-stroke Ditcher Bucket*. They are fully covered by patents issued and pending.

The *Skimmer* is a heavy and effective $\frac{3}{4}$ -yard bucket, with bottom hinged at the toothed end, and is carried upon an 18-foot boom giving it 14 feet of horizontal digging travel. Cuts a swath 32 feet wide leaving a smooth surface, finished to grade—the bucket ideal for road and street excavation.

The *Pull-stroke Ditcher* also has a hinged bottom which swings free in dumping and is self-cleaning in the stickiest clay. Made in eight sizes, 14" to 54" wide, and usable to a depth of 20 feet. In ditching it stands always on solid ground. In cellar excavation it operates from the street level and does not have to be hauled out of the pit at completion of the job.

The Keystone is a versatile, portable, general utility power shovel for contractors' use. It weighs 17 tons, has Crawler Mounting and is equipped with Climax Gas Engine (4 cylinder, 57 H.P., Model T U) or Keystone double 6x6 steam shovel engine (40 H.P. on brake test) as desired. The cost is low.

KEYSTONE DRILLER COMPANY — BEAVER FALLS, PENNA.

170 Broadway, New York

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KEYSTONE SHOVEL

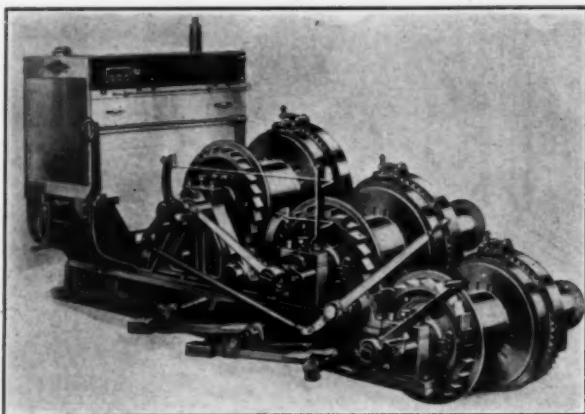
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Improved Three-Drum Gasoline Hoist

New Arrangement of Levers Makes Operation Easier

THE hoist exhibited by the Clyde Iron Works, Duluth, Minn., at the Chicago Road Show, was a three-drum gas hoist with bull-wheel swinger attached, powered by a 50-horse-power, 4-cylinder, Waukesha engine with free engine clutch. The major parts of the engine were arranged on a display board inviting close inspection. One feature of special interest about the hoist, as illustrated, is the arrangement of the operating levers in such a manner that the operator can handle a load without reaching for a lever or moving from one lever to another. The motor speed is controlled by a new accelerating lever not shown in the illustration, very similar in design and operation to the throttle lever on a steam-driven hoist. This lever is brought forward within easy reach of the operator's hand.

The hoist is specially adapted to the handling of material with a clam-shell bucket. The capacity rating is $\frac{3}{4}$ -yard bucket on heavy materials and 1-yard on coal, cinder and other light materials, with a swinging speed of 40 feet per minute. This hoist may of course be used with any type of derrick of sufficient capacity. The rear drum handles the boom peaking line, while at the option of the operator the second or front drive can be used for closing and lifting the bucket, with the other for



A THREE-DRUM GAS HOIST WITH THREE-WHEEL SWINGER ATTACHED

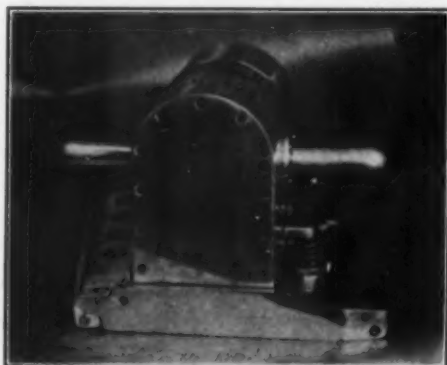
tripping and placing the load. The brake levers on the middle and front drums are so arranged that the operator can easily hold both lines with one foot while swinging the boom.

The hoist, with a capacity of 7,000 pounds at 170 feet per minute on a single line, has many uses when not handling materials. These uses include straight hoisting, pile driving, and handling scrapers. The general hoisting parts are entirely interchangeable with a 7 x 10 Clyde steam hoist.

A Portable Electric Sander

New Machine Finishes a Day's Hand Work in One Hour

THE new Model E Barker sander and grinder is a portable electric machine which does hand work at machine speed. It is made by R. L.

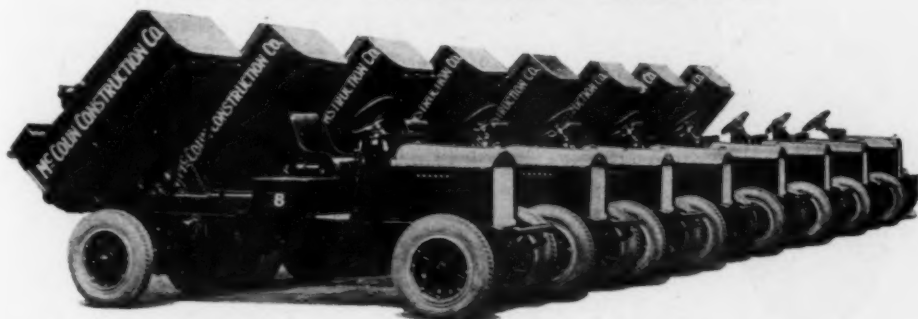


PORTABLE MACHINE FOR SANDING FLOORS

Barker & Company, 642 West Washington Boulevard, Chicago, Ill., for sanding any flat surface. The outstanding mechanical features of this new piece of equipment are that the gears and ball bearings are totally enclosed, running in oil, with dust-proof compartments. The motor, which is a Universal of about $\frac{1}{4}$ -horse-power, and operates from any 110-volt circuit or from 220-volt circuits, is mounted in a dust-proof compartment. The drum around which the sand or emery paper is clamped is dynamically balanced and all these parts are enclosed in the upper housing. There is a base with rollers to guide the machine over the work, and between this and the upper power-plant there is an accurate screw adjustment for depth of cut, as well as a spring to relieve the pressure of the drum on the work when finishing sanding or grinding. The dust cover holds in the dust. This sander and grinder uses metal abrasive paper as easily as sand paper. Therefore, the machine can be used on any kind of flat work in grinding as well as sanding. It is said that the machine, which is ideal for bench use, can also be used quickly for removing varnish from floors and, in addition, without gumming the paper.

United

MOTOR TRUCKS
IN ROAD CONTRACT SERVICE



THE United "Constructor" is a high speed, single batch unit, designed and built for road contractors' work only. Every detail of its construction is chosen to meet the exacting requirements of this service.

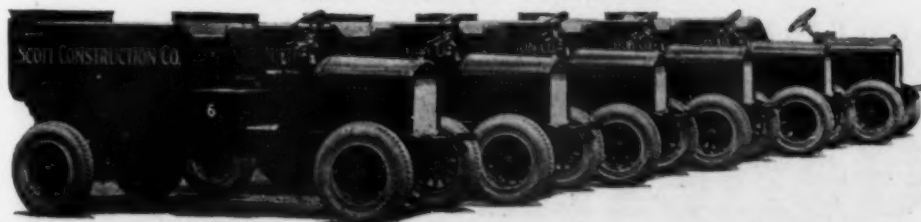
There is no better Contractor's Truck Built than the United "Constructor"

The test of actual use under the hardest conditions has proven this true. Owners of United fleets are unanimous in their praise of the performance, dependability and low operating cost of the United.

Buyers of road building equipment should be interested in some of the records made by the United through a season's use. We will gladly furnish these on request.

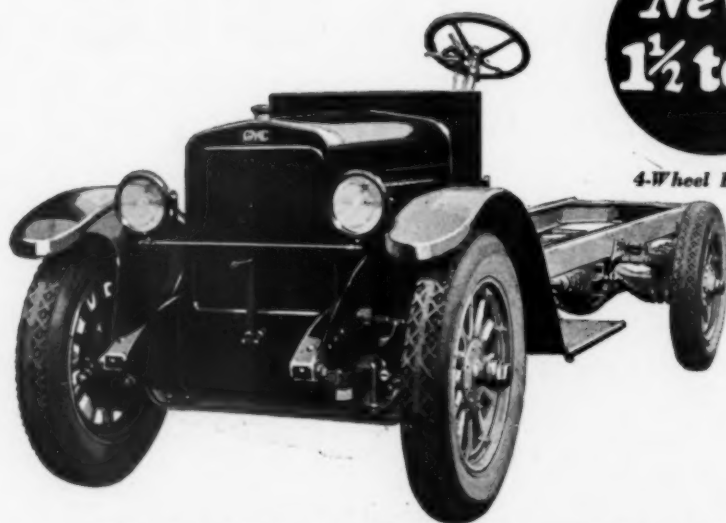
United "Constructors" are built for one job, sold for one job and serviced on United's exclusive "Instantaneous Service Plan."

United Motors Products Co., Grand Rapids, Mich.
Quality Transportation Units Since 1910.



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Two New Trucks



New
1 1/2 ton

4-Wheel Brakes

The General Motors Truck Company now has on display at its distribution centers throughout the country two entirely new truck chassis. These new models are designed to meet the swifter pace of modern business and the safety necessitated by ever-increasing street traffic. It will pay you to step in and inspect these new models today. If you cannot, write for descriptive literature immediately.

The General Motors Truck Company builds trucks and tractor trucks from 1 to 15 tons capacity.

See these New Models now on Display

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Both have new and more powerful engines with higher governed speed—full pressure engine lubrication—three point suspension with rubber cushioned insulation to reduce vibration and shock and insure longer life.

Both have mechanical 4-wheel service brakes and rugged emergency brakes. Simple in design and positive in action. Provide safe operation and complete control in all traffic.

Both have complete electric starting, lighting and ignition systems—standard equipment. Greater comfort for the driver with ample leg-room, easy steering and handy shift lever.

Both have new type rear axle with pressed steel banjo housing. Differential accessible through removal of rear plate only.

Both have greater strength and sturdier construction than other trucks of like capacities—without excess weight. Both represent years of experience in motor truck building.

**New
1 ton**

4-Wheel Brakes



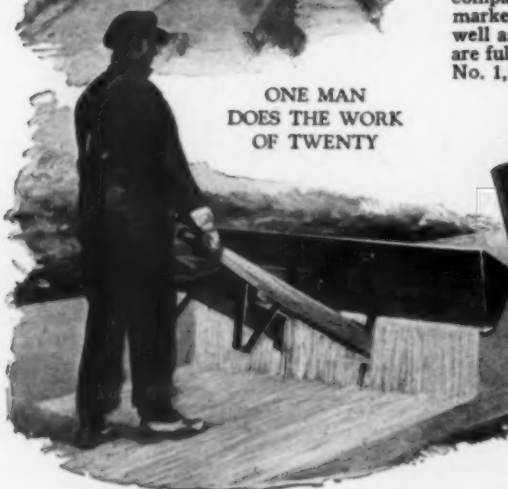
Trucks



Why Pay An Army To Do A One Man Job—Cure Concrete Better



ONE MAN
DOES THE WORK
OF TWENTY



One by one contractors have freed themselves of the labor and expense of old time curing methods by using *Dowflake* to replace ponding, earth and straw covering, moistening, inspection and all the other troubles of the old awkward ways.

State by state—after thorough testing, highway departments have accepted and endorsed the modern *Dowflake* method of curing and have approved the new way in their specifications.

Today one man at an engine will unload more cargo from a ship than a thousand laborers could move in the same time.

And, likewise, *Dowflake* will do more concrete curing in an hour than a flock of teams, scrapers, laborers and hose men with pipe lines and loads of earth can do full time for several days.

Likewise, when the curing is complete, *Dowflake* leaves a clean pavement while under old methods clearing away earth and straw and shaping shoulders was a bigger job than the curing with *Dowflake*.

Why pay an army to do a one man job?

The improved form of Calcium Chloride, which this company has developed and for some years past has marketed under the trade-name "*Dowflake*," as well as the method of manufacture of this product, are fully protected by United States Letters Patent No. 1,527,121, dated February 17, 1925.

Mail the
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And the change has been made by a modern maintenance method, by means of which moisture is maintained in road surfaces.

Moistures first great improvement came from dust control. Roads that had put a pall of dust on everything ceased to send out discomfort and disease.

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This moisture—the saver and keeper of roads, can be put into road surfaces by distributing *Dowflake*—a clean, white, flaky, odorless dust-layer which absorbs several times its weight in moisture from the air, holds the moisture for months, maintaining continuously the appearance of having received a light rain.

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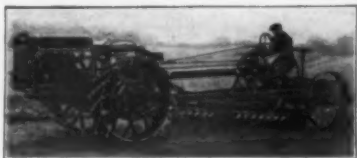
Paver—7, 13, 21 cu. ft. of Mixed Concrete. Auxiliary equipment and choice of power to suit individual needs.

Construction Mixers—10, 14, 21, 28 cu. ft. of Mixed Concrete. Steam, gasoline or electric power. Mounted on trucks or skids. Rubber tired wheels optional. 28-S on skids only.

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A 2750-VII-C



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"Thirty" Grader

**Cuts Your Fine Grading
Cost 50 to 80%**

The Shawnee "Thirty" Grader does all of the subgrade work on your paving job.

1. Cuts the trenches for the road forms.
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4. Makes final cut with absolute accuracy, as it is the only grader that has no lost motion and no give in the frame.
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The Shawnee is the only machine built for subgrade work and is the only machine that can do the classes of work enumerated above as it pulls the blade instead of pushing it, so that it always follows the pull of the drive wheels instead of swinging out of line as all blades do that are pushed ahead of the power wheels.

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THE 5L-CT Jaeger shown illustrated on the left is the famous One-Sack Jaeger Mixer with Power Loader, which increases the output of a mixer 50 to 75%. While one batch is being mixed, another is being assembled. The 5-L is also equipped with the exclusive Jaeger Tip Over Accurate Measure Water Tank and the Gravity or Balanced Device described below.

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JAEGER Service has placed Jaeger Mixers in the forefront of all concrete mixers. Chosen by thousands of contractors for every type of construction work, the Jaeger is backed by the reputation—character—and resources of an internationally known organization. Every Jaeger sold means that a contractor has bought guaranteed service and satisfaction.

12 EXTRA BATCHES AN HOUR

THAT is what it means to use a Jaeger Mixer on every job. The Jaeger Automatic Dumping Device tilts the drum from the revolving position to discharge position in less than two seconds. It returns it to the mixing position in the same time. You save 10 seconds on every batch—twelve extra batches an hour. Think what that means in time and money saved on every job.

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**JAEGER BUILDS 36 DIFFERENT MIXING OUTFITS.
ALL JAEGER MIXERS COMPLY WITH THE A. G. C.
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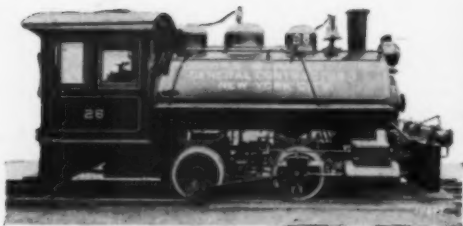
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are not Jaegers. "The Jaeger" is far superior to any mixer made, and should not be confused with inferior machines, even though they be of the tilting-drum type. Protect yourself by getting the "genuine Jaeger." Look for the name on the drum, and the flat spots inside. Write us for the name of the distributor nearest you.

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other makes—"*

Here is the opinion of Mr. F. W. Allen, Vice-President of Rodgers and Hagerty, Inc., one of the largest contracting companies in America. This company has fifteen Vulcan Locomotives on various jobs in different sections of the country. The first Vulcan was purchased in 1912.

The Vulcan shown here is an 11-in. x 16-in. cylinder, 21-ton, four-coupled saddle-tank type, with automatic couplers and of standard gauge.

Among the big features, according to Mr. Allen, are its simplicity of construction, and low maintenance cost. What Mr. Allen says is typical of what users are saying of the Vulcan Steam Locomotive wherever used—in contracting work, around steel plants, in quarries, mines, etc. The long-lasting capacity of Vulcan Locomotives explains in part why Vulcans once used are always used. The obsession of Vulcan Engineers for refinement of detail and thoroughness of workmanship has placed the Vulcan in a class by itself. The "reason why" for Vulcan popularity is explained in the Vulcan Steam Locomotive Bulletin CE. Get your copy.

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The main street of Poyette, Wis., paved with Stanolind Paving Asphalt helps make a good town better.

Better Streets *make* Better Towns

WHEN the city fathers of Poyette, Wis., determined, back in 1919 to make the main street of their town, which is a part of Main Highway No. 10, as good a street as could be built, they naturally decided that it must be built of Stanolind Paving Asphalt.

Five years later, J. S. Jamieson, chairman of the street committee wrote, "The pavements constructed then have given complete satisfaction and today they are in the best of condition. The cost of maintenance has been at a minimum. To anyone anticipating the building of good serviceable streets, I certainly would recommend the use of Stanolind Paving Asphalt.

A glance at the picture above shows the excellent condition of the main street in Poyette and a likeness of Mr. Jamieson

who was so largely responsible for this fine improvement.

This is one of the Wisconsin towns which has learned that better streets make better towns. They not only bring about a greater degree of cleanliness and order, but increase business. Well paved towns and cities attract people who avoid towns and cities with poorly paved streets. Good streets attract people from the surrounding country and rural folk when they are in town are buyers.

Good streets have become an economic necessity and the best of good streets is assured if Stanolind Paving Asphalt of the proper grade is properly used. You may be certain that our staff of road engineers—maintained at our expense for your benefit—will gladly cooperate with you on your street improvement program.

Put your street and road problem right up to the manager of our nearest branch office—write, phone or wire him today.

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A shovel should—

*Deliver the Greatest Service
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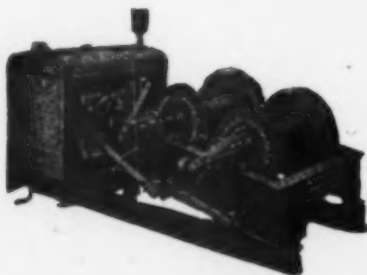
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WILL DO IT

OLIVER AMES & SONS CORP.

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**The American Triumph
All-Steel
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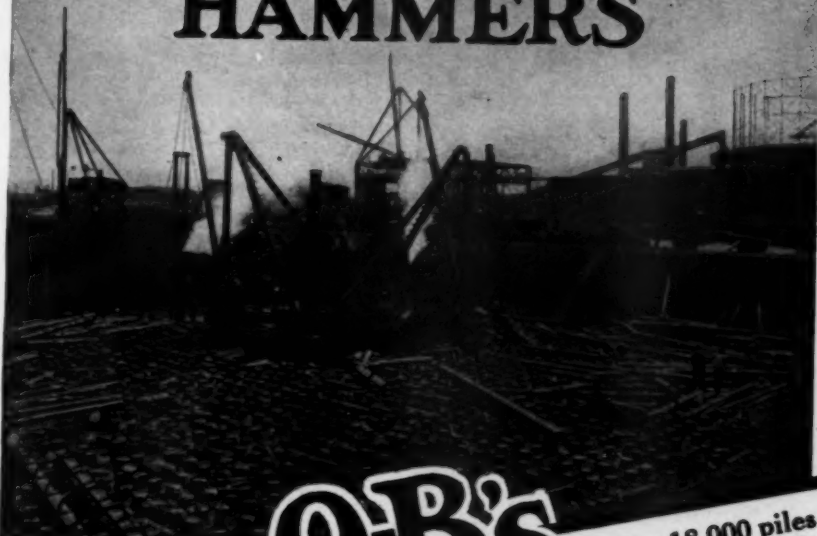
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Another big job for McKIERNAN-TERRY HAMMERS



Five 9-B's

driving 18,000 piles for
the foundation of the

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The work for this \$30,000,000 plant, at 14th Street and East River, New York City, is being handled by the P. T. Cox Contracting Company. It involves, at present, 18,000 wood piles, spaced 2-ft. 6-in. centers, driven as a mat covering two city blocks. Piles average 30 ft. penetration, the majority with points 8 in. to 11 in. diameter, with butts up to 16 in. The driving is very hard, into a dense, heavy mixture of coarse sand and clay.

"We have been easily maintaining 10 piles per 8-hour day per hammer," writes the P. T. Cox Contracting Company. "We have found McKiernan Terry 9-B Hammers very satisfactory in every respect."

The equipment on the job consists of five 9-B Hammers, operated in two travelers with swinging leads, each operating two hammers; and one land rig. Note perfect condition of pile butts in photograph.
Bulletin 31 describes all McKiernan-Terry Hammers.

McKiernan-Terry Drill Company
Rock Drills Pile Hammers Lifting Jacks
Mining and Quarrying Machinery
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'Til They Wear Out!**



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The Everhot tool can be used any time—any place. Its self-contained torch keeps the brand hot, thus permitting continuous use. The fuel is ordinary gasoline.

Everhot Equipments can be obtained with Standard letters, or special trade mark designs.

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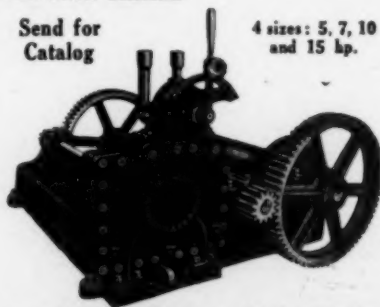
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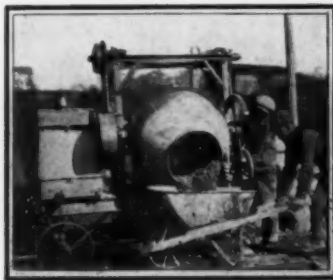
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BAKER MANEY
Self Loading Scrapers



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a foundation job

Pouring 75 Yds. of Concrete a Day!

Kwik-Mix Concrete Mixers are all that the name implies. Recently Albert Pergande, a Milwaukee contractor, used a Kwik-Mix No. 5L—the one-bag size—on a foundation and flooring job. He was able to get as high as 75 yards of thoroughly mixed concrete a day and he did it easily.

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BUY THE 1925 MODEL ARCHER MIXER

LET us quote on your concrete equipment requirements. There is an Archer Mixer which will serve you best and we want you to know all about it.

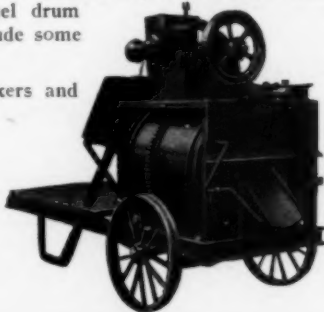
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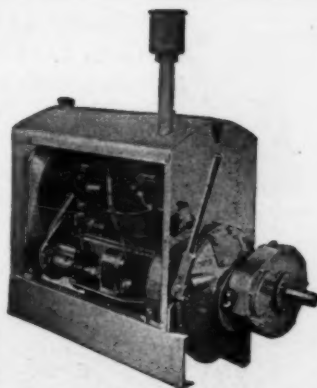
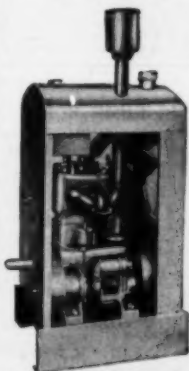
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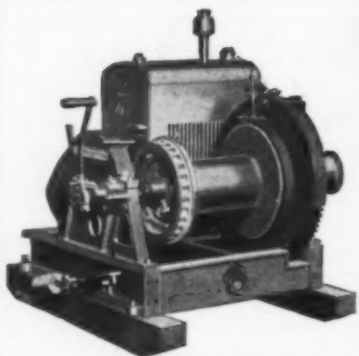


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Unit Construction: Second drum unit can be added any time.

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CAPACITY $1\frac{1}{2}$ to $2\frac{1}{4}$ CU. YDS.
PER MINUTE.

Equipped with absolutely
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Clears path 8 feet wide.

Guaranteed to excavate
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Swivel chute permits loading in any position.

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IT is small in size,
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Automatically dump when loaded. Stiff leg holds
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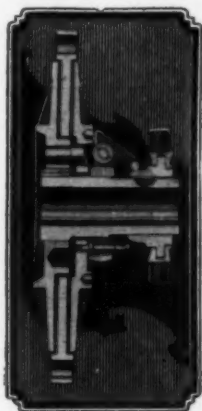


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An old tractor, worn beyond repair, stood stripped to engine, Twin Disc Clutch and frame. The owner had use for the power plant, unless the clutch was too badly worn.

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The Price Tag!

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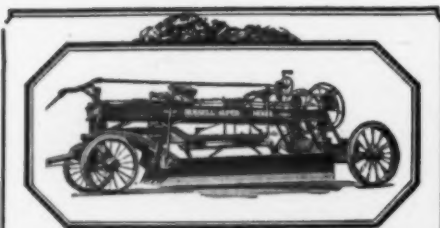
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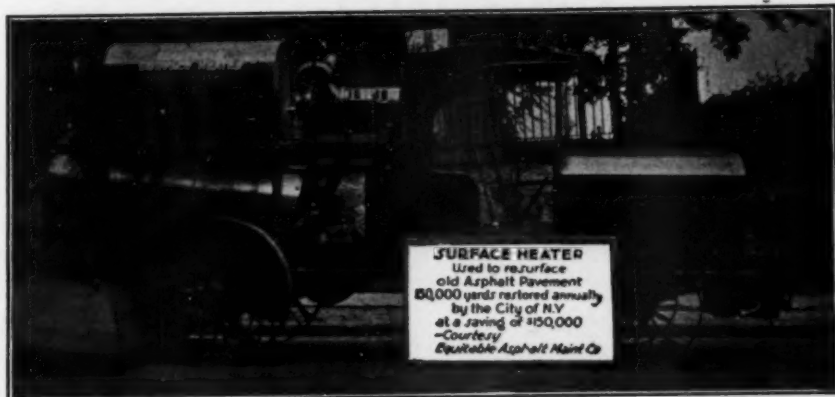
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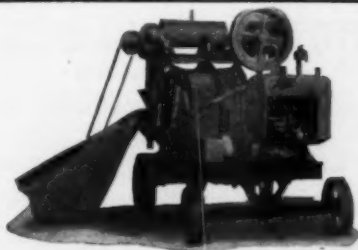
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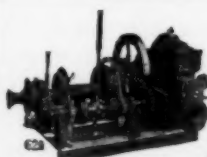
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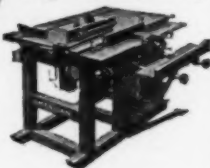
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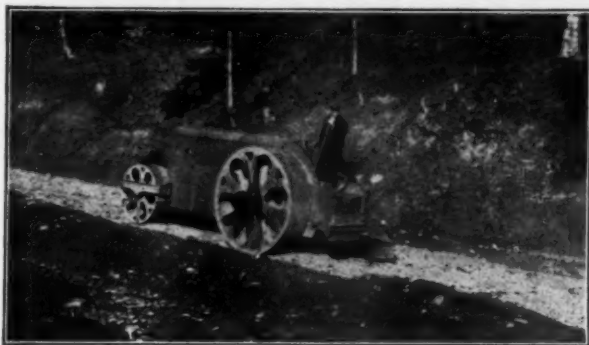
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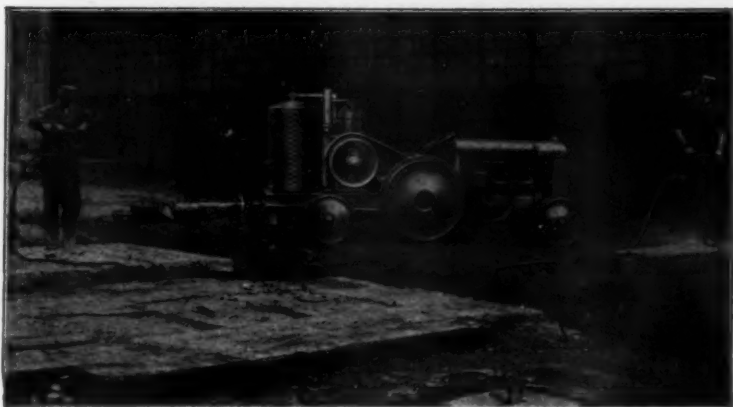
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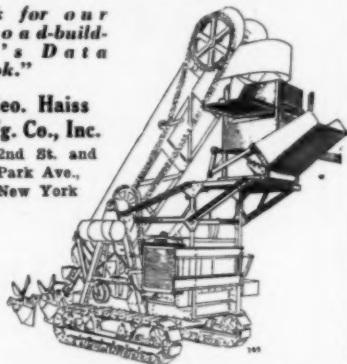
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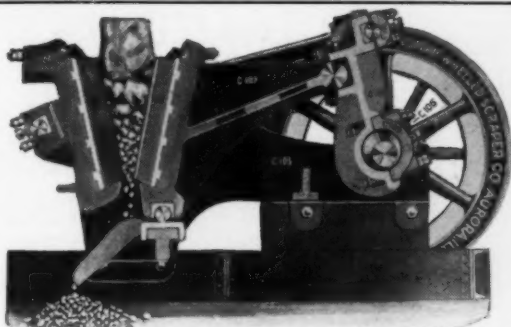
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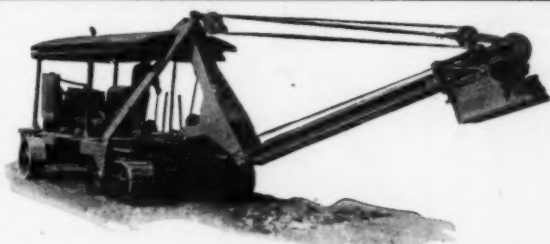
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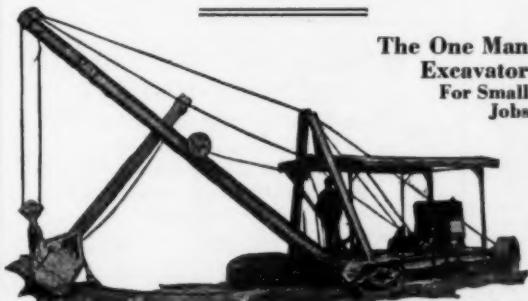
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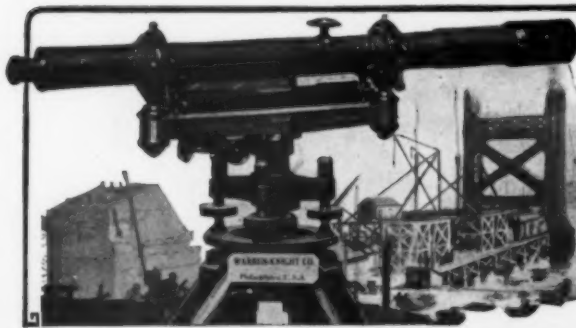
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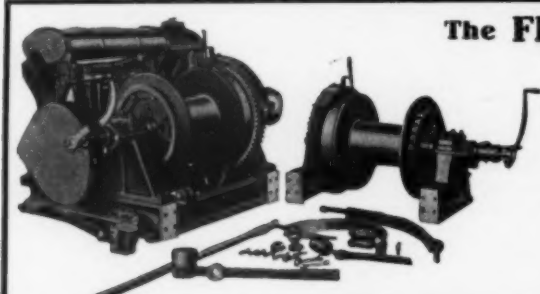
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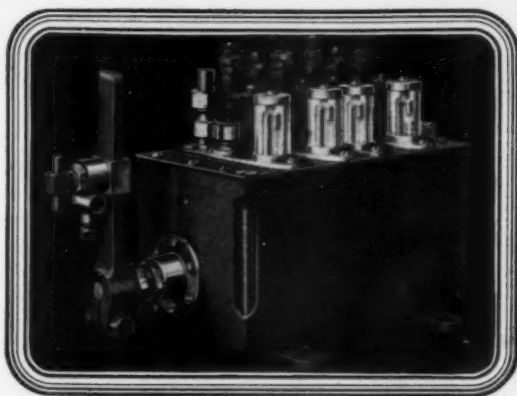
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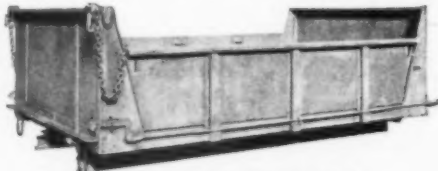
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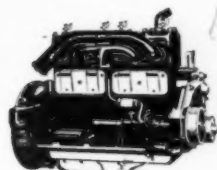
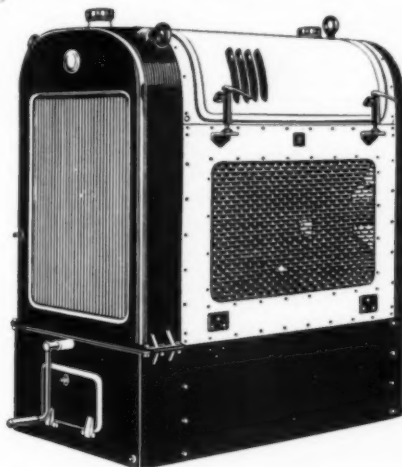
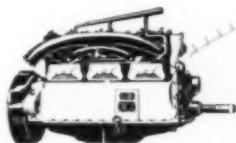
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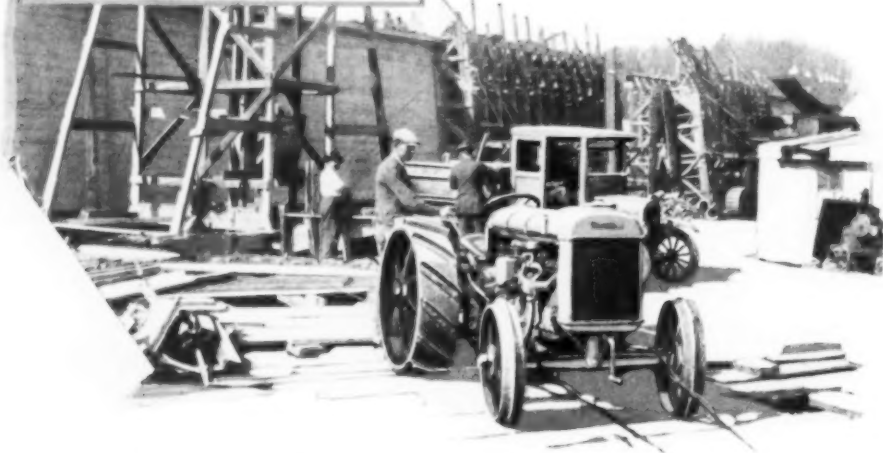
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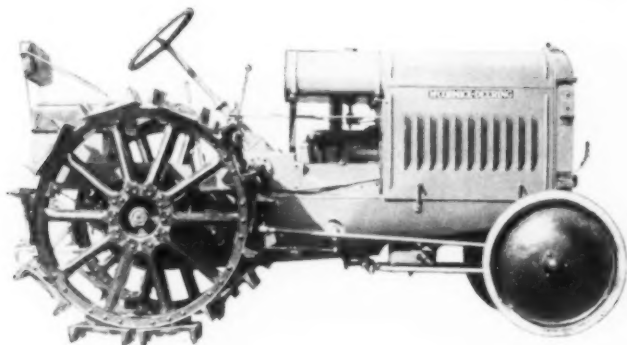
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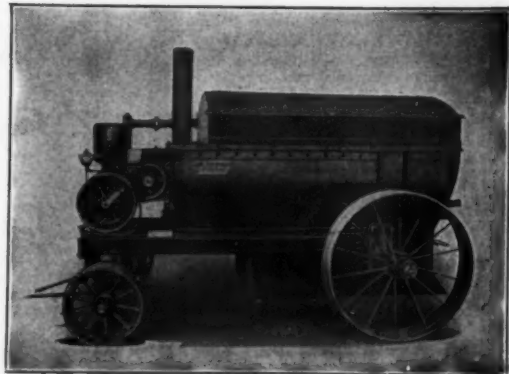


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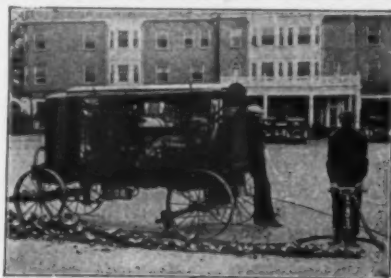
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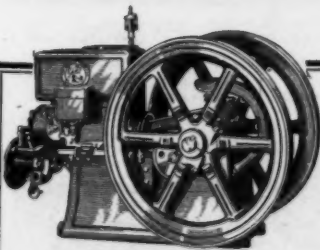
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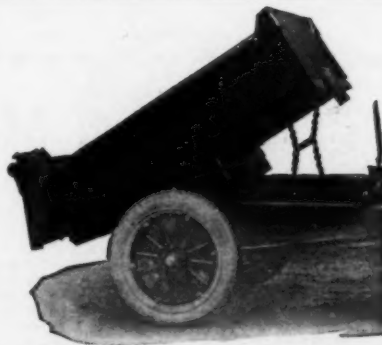
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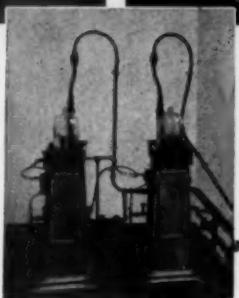
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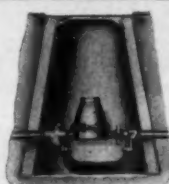
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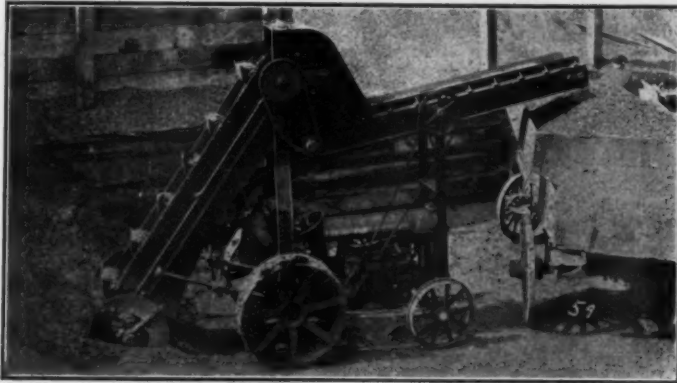
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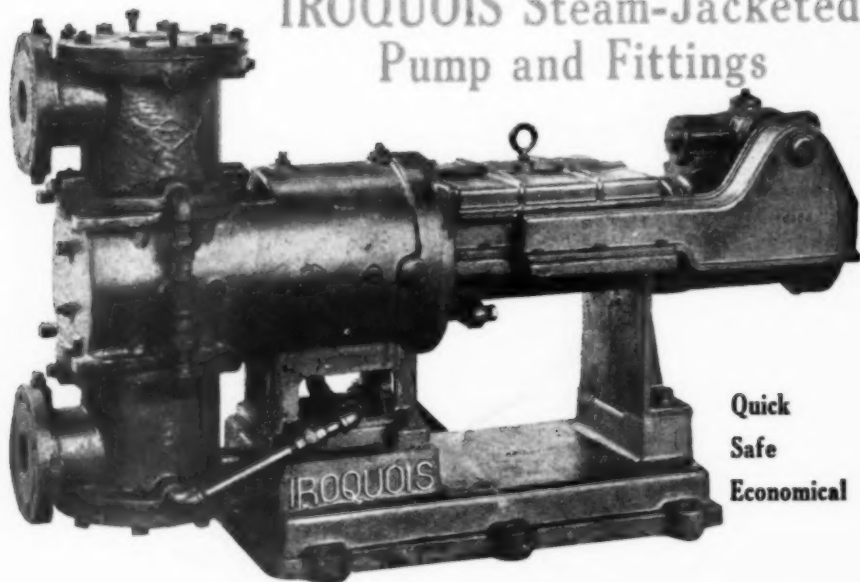
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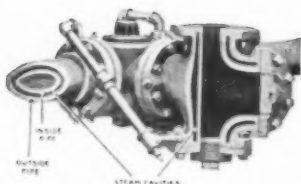
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